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FINAL CONTAMINATION ASSESSMENT PLAN AND HEALTH AND SAFETY PLAN NAS WHITING FIELD FL

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FINAL

OCTOBER 1991

CONTAMINATION ASSESSMENT PLAN
HEALTH AND SAFETY PLAN

NAVAL AIR STATION
WHITING FIELD
MILTON, FLORIDA

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA
29411-0068

CONTAMINATION ASSESSMENT PLAN

NAVAL AIR STATION
WHITING FIELD
MILTON, FLORIDA

CTO NO.: 0009

Contract Number N62467-89-D-0317

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OCTOBER 1991

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1.0 INTRODUCTION

ABB Environmental Services Inc. (ABB-ES) was contracted by the Naval Facilities Engineering Command, Southern Division (SDIV) to prepare a Contamination Assessment Plan (CAP) for four sites at Naval Air Station (NAS) Whiting Field, Milton, Florida. The purpose of the CAP is to outline field investigations and sampling programs for the sites that will assess the extent of petroleum contamination caused by the release of fuel as in the case of the AVGAS spill site or leaky storage tanks in the case of three other sites. The following report presents the site locations, site histories and conditions, and rationale for the proposed investigations which will be implemented during the Contamination Assessments (CA).

2.0 BACKGROUND

2.1 SITE DESCRIPTION. The U.S. Naval Air Station (NAS) at Whiting Field is located in north-central Santa Rosa County in the town of Milton, Florida, approximately 10 miles northeast of Pensacola (see Figure 1). NAS Whiting Field presently occupies a 3,490-acre tract of land, with easement rights to an additional 457 acres. The station is currently the home base of Training Air Wing Five (TRAWING FIVE) whose mission is to administer, coordinate, and supervise flight and academic training. The station is divided into a North Field, where fixed wing training takes place, and a South Field that is used for helicopter training. Support facilities are located between the two fields.

The project comprises four separate sites within the base.

2.2 SITE HISTORY. The following is background information on the four sites at NAS Whiting Field where contamination assessments will be performed. See Figure 2 for locations of these sites within the base. Table 1 presents information on the storage tank systems at each site.

Facility 1467, North Fuel Farm. The site is located north of Tow Lane and contains nine steel, underground storage tanks (USTs) which were installed in 1943. Of these nine tanks, only tanks 1467-G, 1467-F, and 1467-H are still active. Each tank has a 25,000-gallon capacity and presently contain water, diesel fuel, unleaded gasoline, and water-contaminated JP-5 jet fuel. The fuel farm was used for sludge disposal during tank cleaning operations from 1943 to 1968. An estimated 25 to 30 gallons of sludge was disposed of from each tank during cleaning operations. Typically, a trench was excavated next to a tank and sludge was placed into it and covered. Previous Initial Assessment Studies (IAS) indicate that lead contamination exists in the groundwater at the site. Groundwater samples from a nearby 152 foot deep monitoring well showed low levels of benzene and toluene.

Facility 1466, South Fuel Farm. The site is located at the south end of Ranger Street and contains nine steel, 25,000-gallon USTs, which presently contain water and heating oil. The tanks were installed in 1943. Only tank 1466 is still active. Tanks 1466-A, 1466-B, and 1466-C were recently made inactive and are scheduled for demolition. Sludge disposal practices at the South Fuel Farm were the same as those at the North Fuel Farm for the same period of time.

Facility 2866, Navy Exchange Service Station. The site contains three 10,000-gallon steel constructed USTs which were installed in the 1950's. An attempt was made to precision test the tanks in October 1989. Tank 2866-A tested tight, but tanks 2866-B and 2866-C failed because of leaks at the seals on the manway ports. The tanks have since been repaired and have tested tight. During the excavation to the manway ports and vent lines, a petroleum odor was detected in the soils around the tanks.

Old AVGAS Fuel Spill Site. The site is Installation Restoration site No. 8 and is located south of building 1406 on the South Field runway. In the summer of

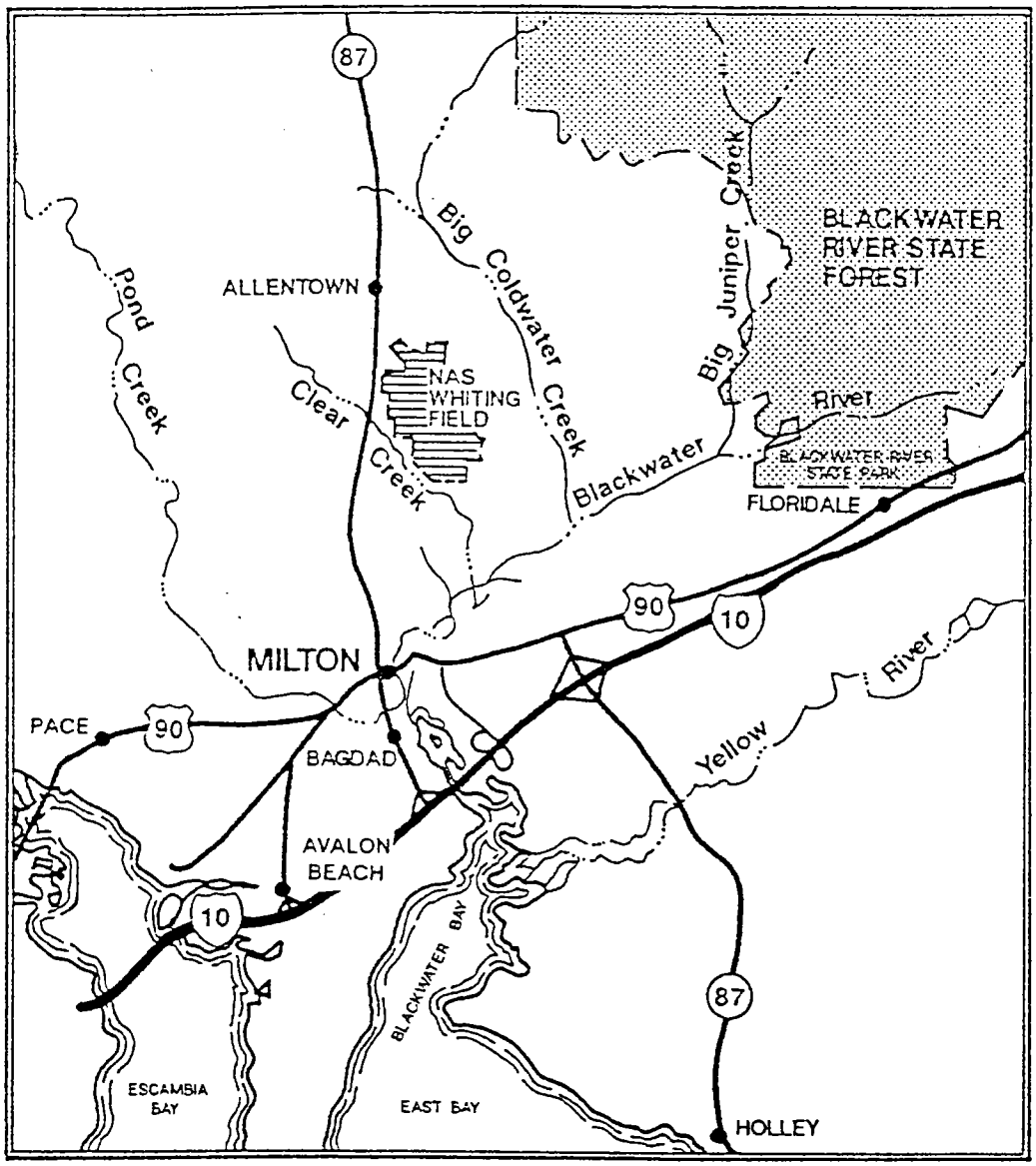


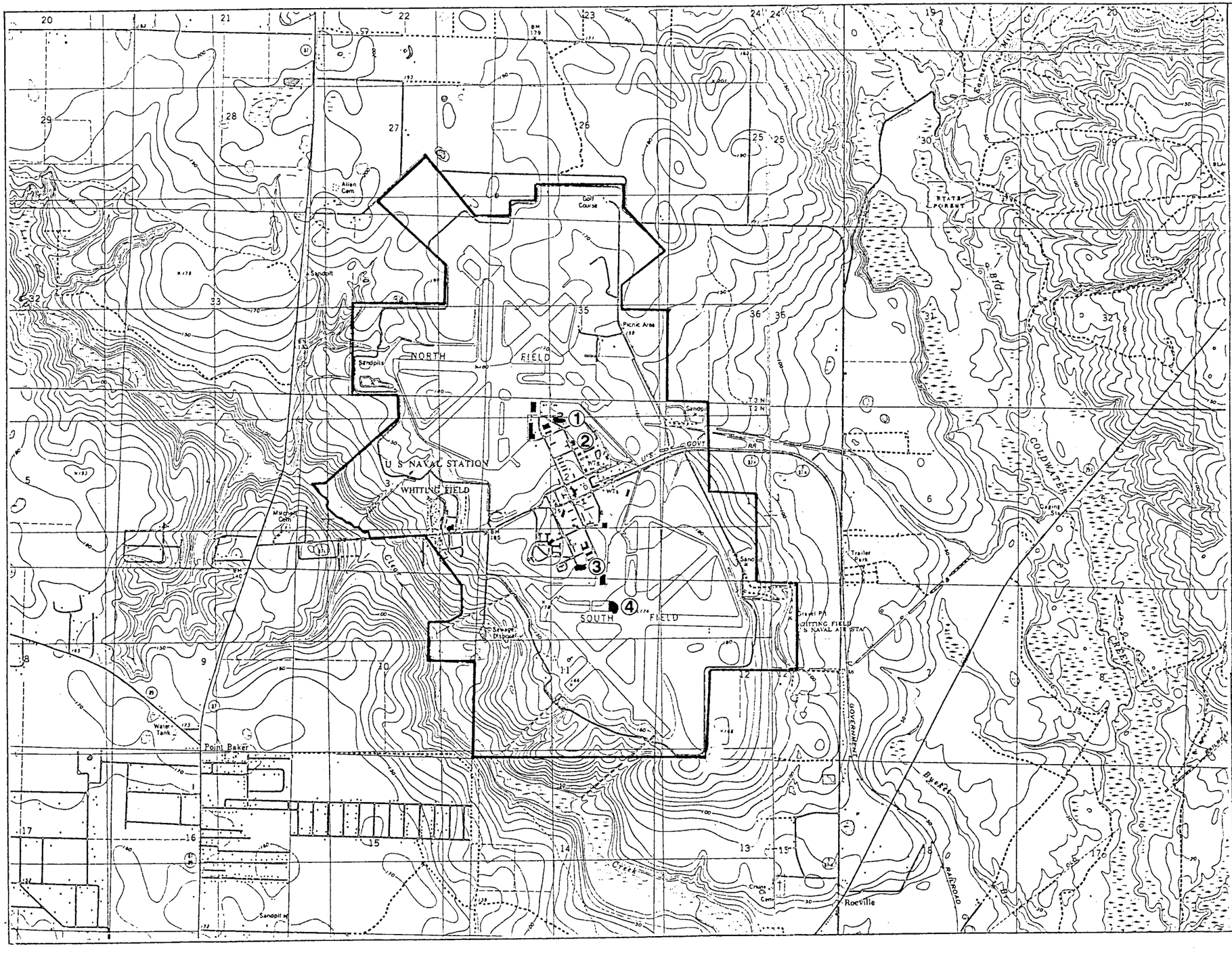
FIGURE 1

FACILITY LOCATION MAP

CONTAMINATION ASSESSMENT PLAN

NAS WHITING FIELD

MILTON, FLORIDA



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LEGEND

1 FACILITY 1467, NORTH FUEL FARM
2 FACILITY 2866, NAVY EXCHANGE SERVICE STATION
3 FACILITY 1466, SOUTH FUEL FARM
4 OLD AVGAS FUEL SPILL SITE

SCALE IN FEET

0 3000 6000

SOURCE:
USGS QUADRANGLE MILTON NORTH, FLORIDA
PHOTOREVISED 1987
AND USGS QUADRANGLE HAROLD, FLORIDA 1973.

FIGURE 2

SITE MAP

CONTAMINATION ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

Table 1
Storage Tank Information
Naval Air Station Whiting Field
Milton, Florida

Tank number	Year installed	Contents	Tank capacity (gallons)	Status
Facility 1467, North Fuel Farm				
1467	1943	water	25,000	inactive
1467–A	1943	water	25,000	inactive
1467–B	1943	water	25,000	inactive
1467–C	1943	water	25,000	inactive
1467–D	1943	water	25,000	inactive
1467–E	1943	water	25,000	inactive
1467–F	1943	diesel	25,000	active
1467–G	1943	unleaded	25,000	active
1467–H	1943	JP–5/water	15,000	active
Facility 1466, South Fuel Farm				
1466	1943	fuel oil	25,000	active
1466–A	1943	empty	25,000	inactive
1466–B	1943	empty	25,000	inactive
1466–C	1943	empty	25,000	inactive
1466–D	1943	water	25,000	inactive
1466–E	1943	water	25,000	inactive
1466–F	1943	water	25,000	inactive
1466–G	1943	water	25,000	inactive
1466–H	1943	fuel oil	15,000	inactive
Facility 2866, Navy Exchange Service Station				
2866–A	1959	unleaded	10,000	active
2866–B	1959	unleaded	10,000	active
2866–C	1959	unleaded	10,000	active

1972, 25,000 gallons of AVGAS was spilled at the site when a rubber fuel line broke and leaked for a 36-hour period during a 3-day weekend. The fuel flowed to a grassy area where it pooled. It is estimated that a 2 acre area was affected by the AVGAS spill.

2.3 HYDROGEOLOGY. The general hydrogeology in the central Santa Rosa and central Escambia Counties area is discussed in the regional hydrogeology section. Hydrogeologic conditions that exist at NAS Whiting Field are presented in the site-specific hydrogeology section.

2.3.1 Regional There are three major groundwater aquifers in the region. The uppermost aquifer exists under both artesian and non-artesian conditions (sand-and-gravel aquifer). The two others are deep, artesian aquifers of the Floridan aquifer system (Upper Floridan aquifer and Lower Floridan aquifer). Virtually all groundwater withdrawn in Escambia and Santa Rosa Counties comes from the sand-and-gravel aquifer (Geraghty & Miller, 1986). Descriptions of the aquifers are presented below.

Sand-and-Gravel Aquifer. The uppermost sediments, extending to a depth of approximately 350 feet, comprise the sand-and-gravel aquifer, which is subdivided into two units. The water table or upper part of the sand-and-gravel aquifer does not constitute a source for large water supplies; however, its primary importance is to recharge the lower, more productive zone of the aquifer. The results of an aquifer test in the Milton area indicate the clayey sand confining unit separating the upper and lower aquifer zones is very leaky. Most large capacity wells in the area, such as the NAS Whiting Field supply wells, are screened in the lower part of the aquifer from about 180 to 330 feet below land surface (bls) (Geraghty & Miller, 1986).

The sand-and-gravel aquifer includes the upper Miocene coarse clastics, the Citronelle Formation, and marine terrace deposits. These three units have similar hydraulic properties and are sometimes indistinguishable. The aquifer consists of poorly sorted, fine to coarse sand with gravel and lenses of clay. The clay may be as much as 60 feet thick. In some areas, the formation also contains wood fragments. The portion of the formation that contains the wood fragments may be as much as 25 feet thick (Marsh, 1966). However, boring logs of wells drilled at NAS Whiting Field do not indicate the presence of these wood fragments (Geraghty & Miller, 1986).

The aquifer contains lensatic zones within the sand that are cemented by iron-oxide minerals. The lenses, known locally as hardpans, have lower permeabilities and, along with the clay lenses, are responsible for the occurrence of perched water tables and semi-artesian conditions in the aquifer. In the NAS Whiting Field area, clay lenses occur in the uppermost 30 feet and in the depth interval of approximately 100 to 170 feet bls (elevation 10 to 70 feet above mean sea level). Although the clays appear to be continuous, they may contain permeable zones or windows (NEESA, 1985).

Floridan Aquifer System. Underlying the sediments of the sand-and-gravel aquifer is the thick (approximately 300 foot), relatively impermeable Pensacola Clay,

below which are thick layers of limestone and shale to a depth of nearly 2,000 feet.

The limestone layers constitute the regionally extensive Floridan aquifer system, which in this area is divided into an upper and lower part separated by the Bucatunna Clay. The Floridan aquifer system receives little or no recharge from the sand-and-gravel aquifer because of the Pensacola Clay confining unit. The potentiometric surface of the Upper Floridan aquifer in the NAS Whiting Field area is about 50 to 55 feet above mean sea level. The direction of groundwater flow is southeast.

2.3.2 Site Specific The following is an excerpt from a report prepared by Geraghty & Miller, Inc., in 1986. The conclusions are based on an investigation of several sites at NAS Whiting Field:

> "The NAS (NAS Whiting Field) is capped by low-permeable sediments consisting of sandy clay or clay ranging in thickness from about 20 to 80 feet. The exception was found at sites located along the west side of the North Field, where these clayey sediments were absent at the surface. Generally, to the total depths of the wells drilled (42 to 180 feet), the lithology is described as fine- to coarse-grained sand with randomly interbedded lenses and layers of gravel and clay.
>
> "The sand-and-gravel aquifer is recharged by infiltration of rainwater at the surface. The downward movement of water through the unsaturated zone can be impeded by clay layers, where they exist, resulting in the intermittent perched water tables. During the installation of a monitoring well, the presence of perched water tables was investigated. This was accomplished by setting the well screen at several different depth intervals as the borehole was advanced. No saturated zones within the upper 120 ft of sediment were found. Likewise, during the drilling operations of all other wells installed at the site, there were no indications that water-yielding zones existed above the zones tapped by the monitoring wells.
>
> "Water levels in the monitor wells installed in the upper part of the sand-and-gravel aquifer ranged from about 80 feet mean sea level (msl) in the north to 45 feet msl in the southern part of the base. Water-level measurements in the monitoring wells were made on October 17, 1986, when only the north supply well W-N4 had been pumping for several weeks. No obvious effects (drawdown) in the water levels of the upper sand-and-gravel aquifer are indicated by the water-table map, which is due in part to the steep hydraulic gradient across the site. Water levels ranged from 11 feet to 130 feet bls and generally are directly related to the topography; that is, the greatest depths to the water table occurred at the highest topographic locations and the shallowest depths to water occurred at the lowest topographic locations. The direction of groundwater flow across the site is generally southeast to south and southwest.

"Water levels measured in supply wells W-S2 and W-W3 (tapping the lower sand-and-gravel aquifer) while they were shut down were compared to water levels in nearby monitor wells (tapping the upper sand-and-gravel aquifer) installed for this study. The comparison did not show a significant difference in head between the two zones of the aquifer. This is best exemplified at the Battery Shop site where four upper sand-and-gravel wells are in close proximity to supply well W-S2. Differences in water levels between the two zones were no greater than a few tenths of a foot. A pumping test at the Battery Shop suggested that the upper aquifer and the lower production zone of the aquifer are hydraulically connected, although flow between the two zones is impeded by clayey sediments.

"Published information of the hydraulic properties of the sand-and-gravel aquifer is scarce. The following specific capacities were determined from test pumping of the NAS wells installed in 1951: W-N2 16.7 gpm/ft (gallons per minute per foot of drawdown), W-W2 23.0 gpm/ft, and W-S2 21.7 gpm/ft. From these values, an average minimum transmissivity for the lower zone of the sand-and-gravel aquifer is estimated to be about 37,000 gpd/ft (gallons per day per foot). This agrees rather well with a transmissivity of 54,600 gpd/ft determined from a pumping test at Milton (Wagner, et. al., 1980) and with the transmissivity estimated from well W-S2 during the Battery Shop study (30,000 gpd/ft)

"Short-term specific capacity tests were run on all the monitor wells after development. Using an empirical relationship, the average minimum transmissivity of the upper saturated part of the sand-and-gravel aquifer was estimated to be about 4,700 gpd/ft."

3.0 INVENTORY OF NEARBY POTABLE WELLS

As part of the HRS II ranking preformed by ABB-ES in May 1991, an inventory of potable wells near NAS Whiting Field was conducted.

Virtually all potable and industrial water supplies in the NAS Whiting Field vicinity are obtained from the sand-and-gravel aquifer, which extends from the surface to an approximate elevation of 150 feet below the National Geodetic Vertical Datum (NGVD) of 1929. Screened intervals of most production wells are at a depth of about 150 to 350 feet bls, depending on the surface elevation and the occurrence of clay lenses, which lie at somewhat erratic depths. A map of the location of wells within 5-miles of NAS Whiting Field is presented in Figure 3.

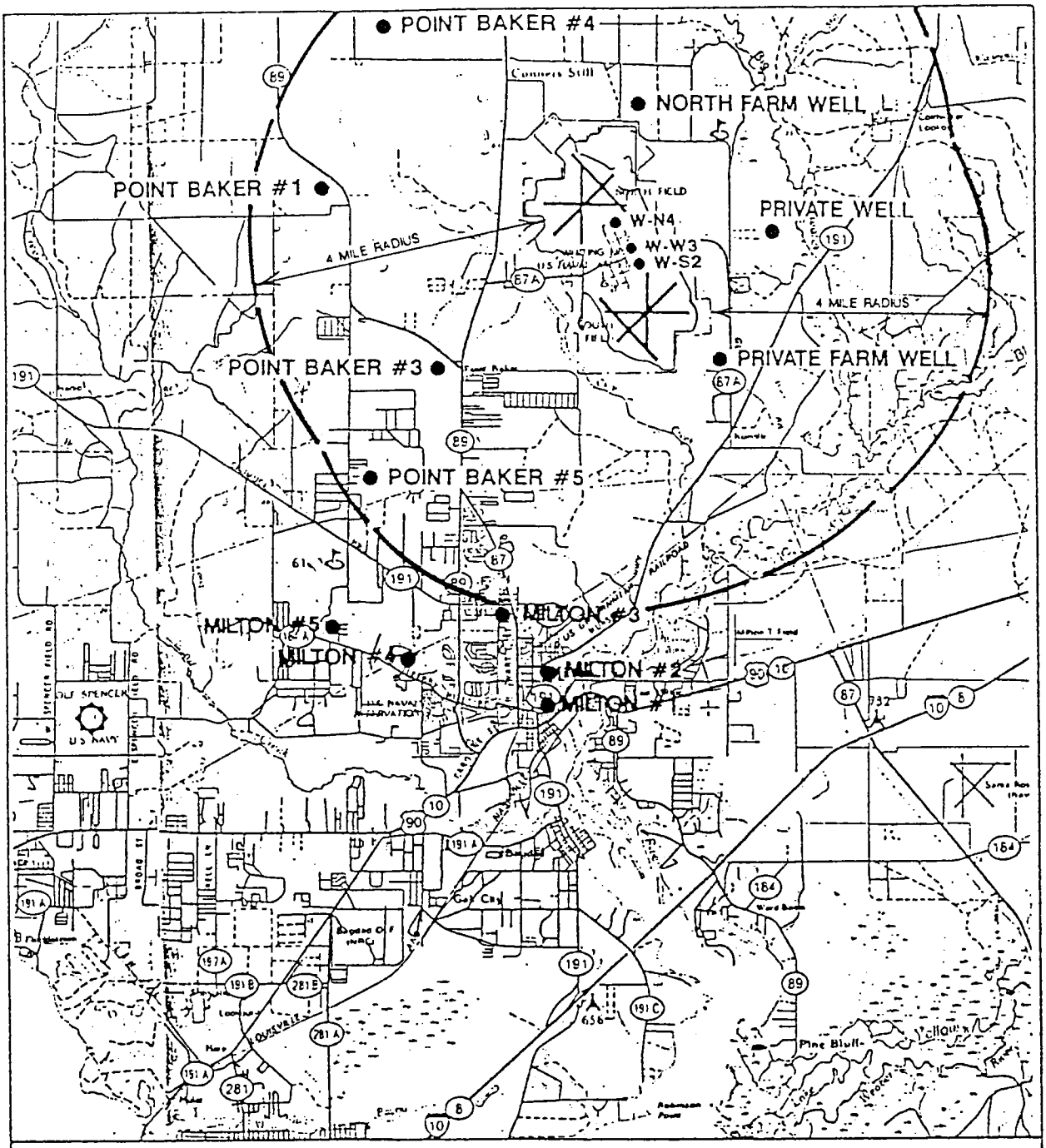
Potable water on base is currently supplied by three wells: the north (W-N4), south (W-S2), and west (W-W3) production wells; however, these are only the latest in a sequence of wells that have been replaced because of insufficient capacity or poor water quality. When the base was built in 1943, three production wells were drilled: the original north (W-N1), south (W-S1), and west (W-W1) wells. In 1951 these wells were abandoned and replaced by new wells (W-N2, W-S2, W-W2) each within 75 feet of the original well. These new wells were probably constructed to deliver increased yields.

The west and north wells, however, contained objectionable levels of iron and were replaced by W-W3 in 1965 and W-N3 in 1975. The replacement north well, which was drilled as a test well, was also found to have an unacceptable iron concentration and was subsequently abandoned and replaced by the currently used north production well (W-N4). The locations of the active Navy wells are shown in Figure 3. Current average pumping capacities from the wells at NAS Whiting Field are: north well, 600 gallons per minute (gpm) and west well, 700 gpm. Flow from the two active supply wells is treated before entering the distribution system. Treatment consists of wellhead granular activated carbon treatment followed by chlorination, pH adjustment, and addition of a sequestering agent to reduce iron precipitation. Production well W-W3 has a granular activated carbon filter unit attached to reduce the trichloroethene concentration in the groundwater. At the request of the Florida Department of Environmental Regulation (FDER), supply well W-S2 was shut down on August 28, 1986, due to concentrations of benzene exceeding the Florida drinking water standard of 1 $\mu g/\ell$ (microgram per liter) in the groundwater. Supply well W-W3 was also shut down on September 25, 1986, due to concentrations of trichloroethene greater than 3 $\mu g/\ell$.

NAS Whiting Field operated with service from only the north production well throughout most of 1987. Testing of an activated carbon adsorption filtration system to treat water from the west well (W-W3) for trichloroethene removal began on November 3, 1987. Upon completion of the operational tests on December 1, 1987, the west well was returned to service. At the south production well (W-S2), an activated carbon filtration system was installed in early 1990.

Water for the City of Milton is supplied by five wells, for East Milton by two wells, and for the Point Baker-Allentown area by three wells; all of which are

screened in the sand-and-gravel aquifer and are outside the 1-mile radius of NAS Whiting Field. Two of the Point Baker wells (P-3 and P-4) are within 2 miles of NAS Whiting Field. Average pumping rates from these two wells is about 500 gpm for P-3 and about 200 gpm for P-4. Water from the Point Baker system is available to residences east and north of NAS Whiting Field, and water from the Milton system is available to those east of Whiting Field.



SOURCE: ATLAS AND GAZETEER
DELORME PUBLISHING CO.

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SCALE IN MILES
0 1 2 4

FIGURE 3
WATER SUPPLY WELLS
IN THE VICINITY OF
NAS WHITING FIELD

CONTAMINATION
ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

4.0 PROPOSED ASSESSMENT PLAN

4.1 FIELD INVESTIGATION. The field investigation for the four sites at NAS Whiting Field will consist of a startup meeting and a Phase I and Phase II field investigation.

Startup Meeting: A startup meeting will be held onsite at NAS Whiting Field. All personnel associated with the investigation will review the scope of work in the Contamination Assessment Plan (CAP) and Health and Safety Plan (HASP). Scheduling, logistics, and special precautions will be discussed.

Phase I Field Investigation: Soil borings (100 feet in depth) will be drilled using a drill rig at each of the sites at NAS Whiting Field to collect soil samples for organic vapor analyzer (OVA) screening following FDER Chapter 17-770.200 (2), Florida Administrative Code (FAC) guidelines. The screening of soil samples from borings will aid in assessing the extent of contamination and provide information for placement of monitoring wells at each site.

The level of effort for completing the Phase I field investigation will consist of drilling a maximum of 16 soil borings (each boring will be less than or equal to 100 feet in depth) at the North Fuel Farm, 20 soil borings at the South Fuel Farm, 8 soil borings at the Base Exchange Service Station, and 12 soil borings at the AVGAS spill site. Soil samples will be collected at 5-foot intervals throughout the soil borings and screened for the presence of petroleum hydrocarbons using an OVA. Tentative locations of proposed soil borings are presented on Figures 4 through 7. Actual locations of soil borings will be determined by the field team as more information is obtained about the contaminant plume.

Phase II Field Investigation: Following the soil boring program, the Phase II field investigation will consist of the installation of groundwater monitoring wells at the four sites and collection of groundwater samples for laboratory analysis. The purpose of the Contamination Assessment is to assess the vertical and horizontal extent and to quantitatively characterize the petroleum contamination at each of the sites. Information from the soil borings collected during the Phase I investigation will be used to estimate the extent of contamination and provide information for the placement of monitoring wells at each of the sites. Monitoring wells will be installed to characterize the contaminant plume and assess the horizontal and vertical extent. Monitoring wells, installed during the Phase II activities will be located using the results of field gas chromatograph (GC) data for benzene, toluene, ethyl benzene, and xylene (BTEX). Tentative placement of the groundwater monitoring wells at the four sites are presented in Figures 4 through 7. The number of monitoring wells proposed for each site is as follows.

North Fuel Farm: 10 shallow monitoring wells (up to 100 feet)
1 deep monitoring well (up to 140 feet)

South Fuel Farm: 16 shallow monitoring wells
1 deep monitoring well

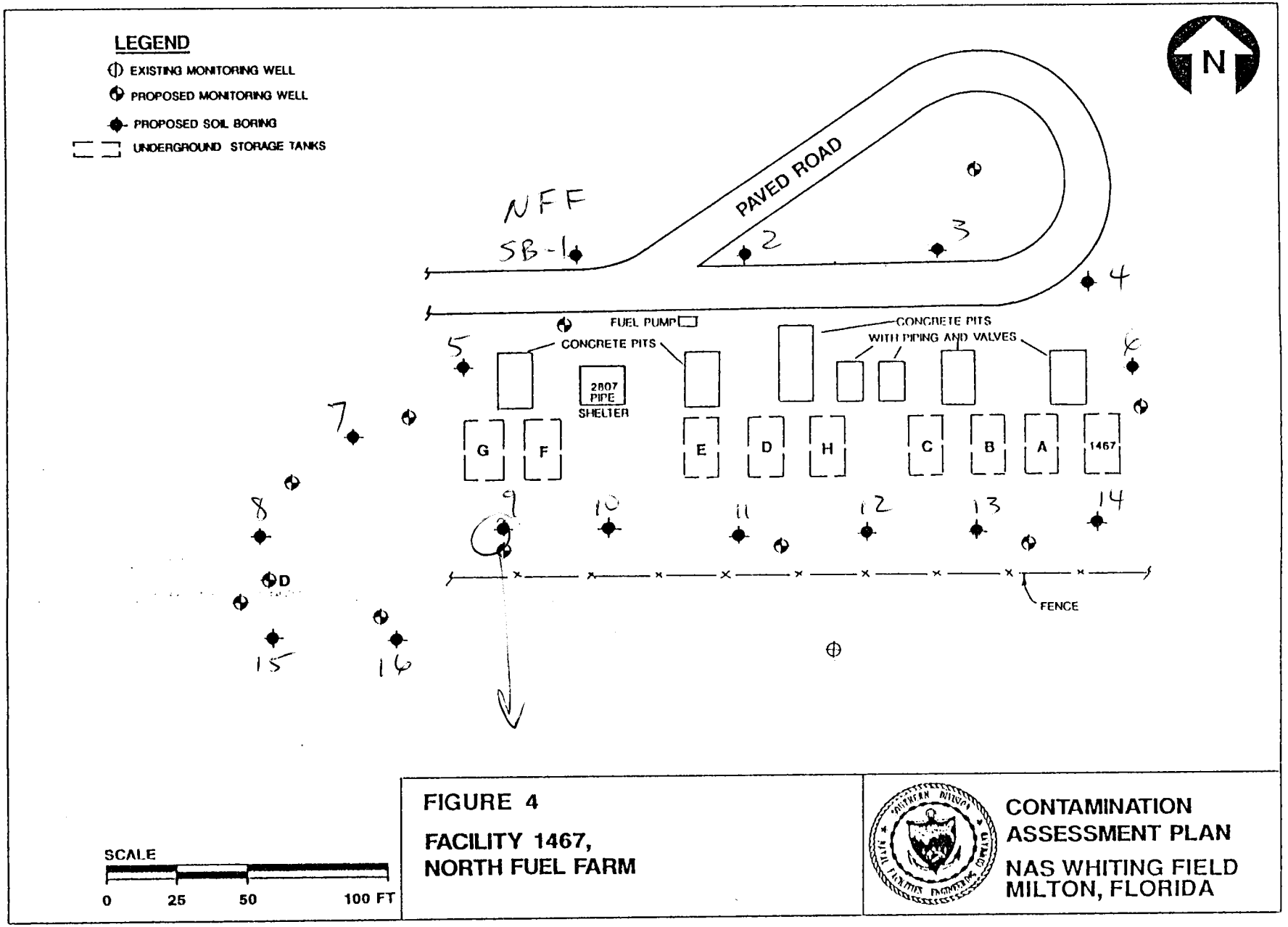


FIGURE 4

FACILITY 1467,
NORTH FUEL FARM

CONTAMINATION
ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

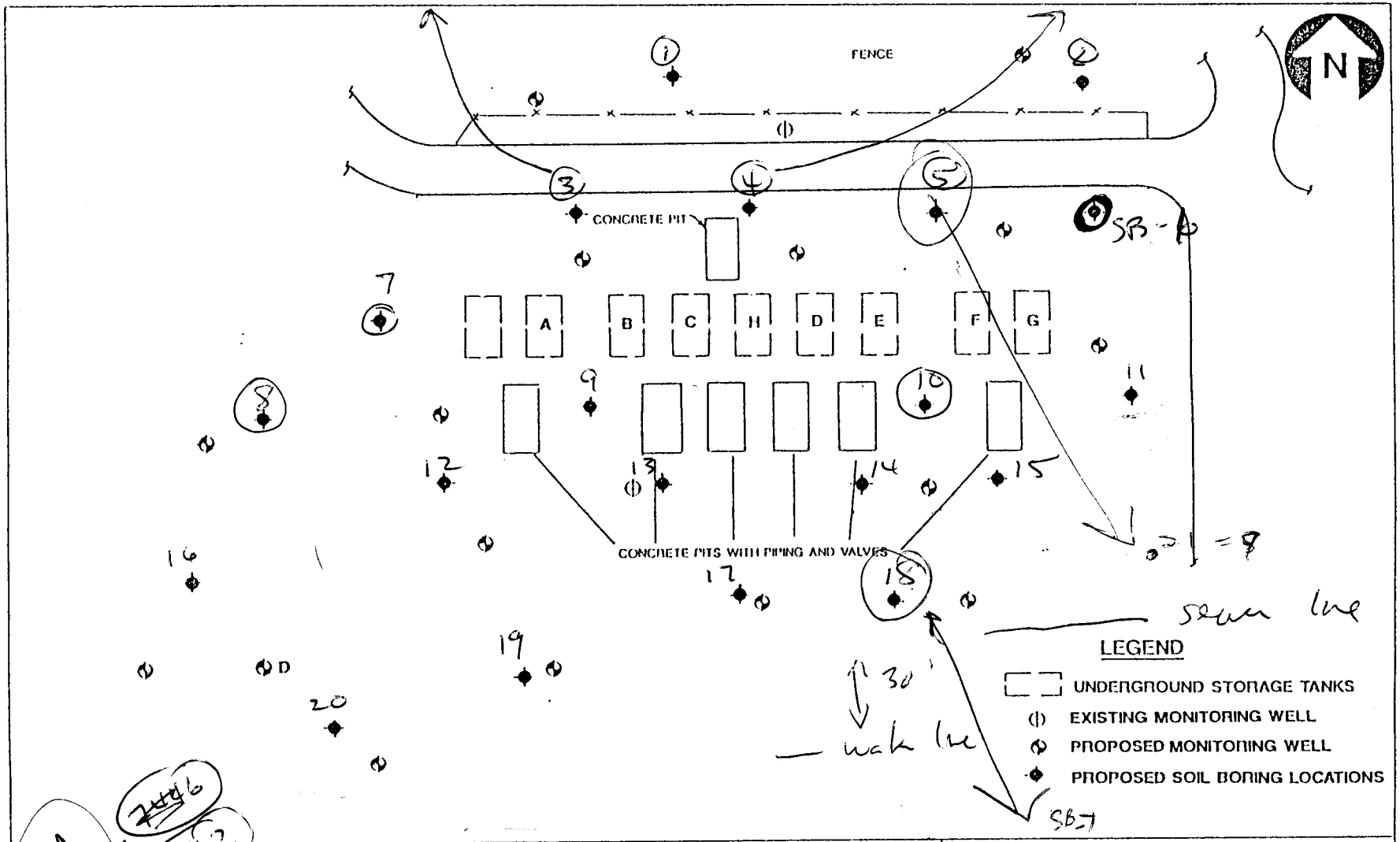


FIGURE 5
FACILITY 1466,
SOUTH FUEL FARM

CONTAMINATION ASSESSMENT PLAN
NAS WHITING FIELD
MILTON, FLORIDA

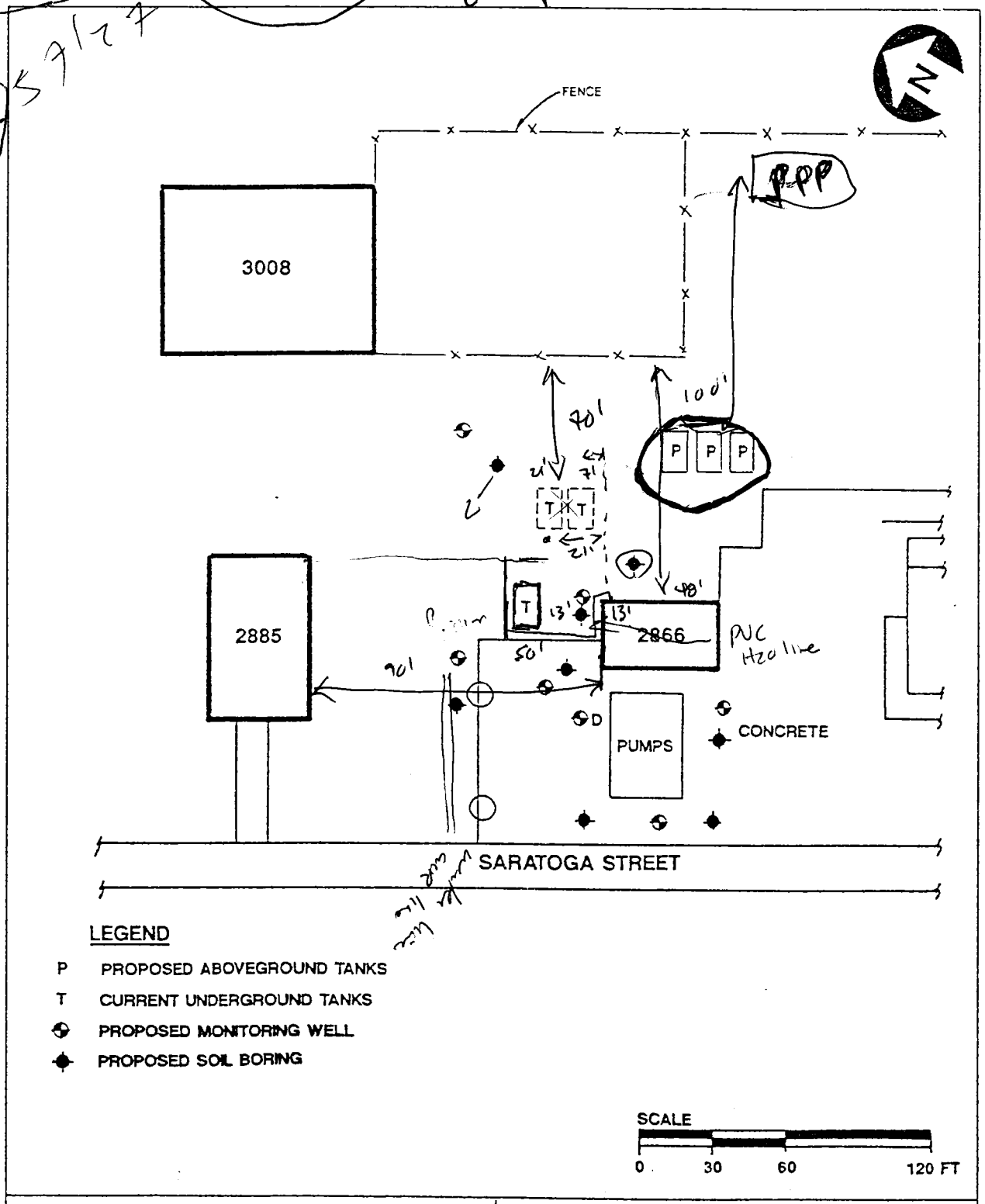


FIGURE 6

FACILITY 2866,
NAVY EXCHANGE SERVICE STATION

CONTAMINATION
ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

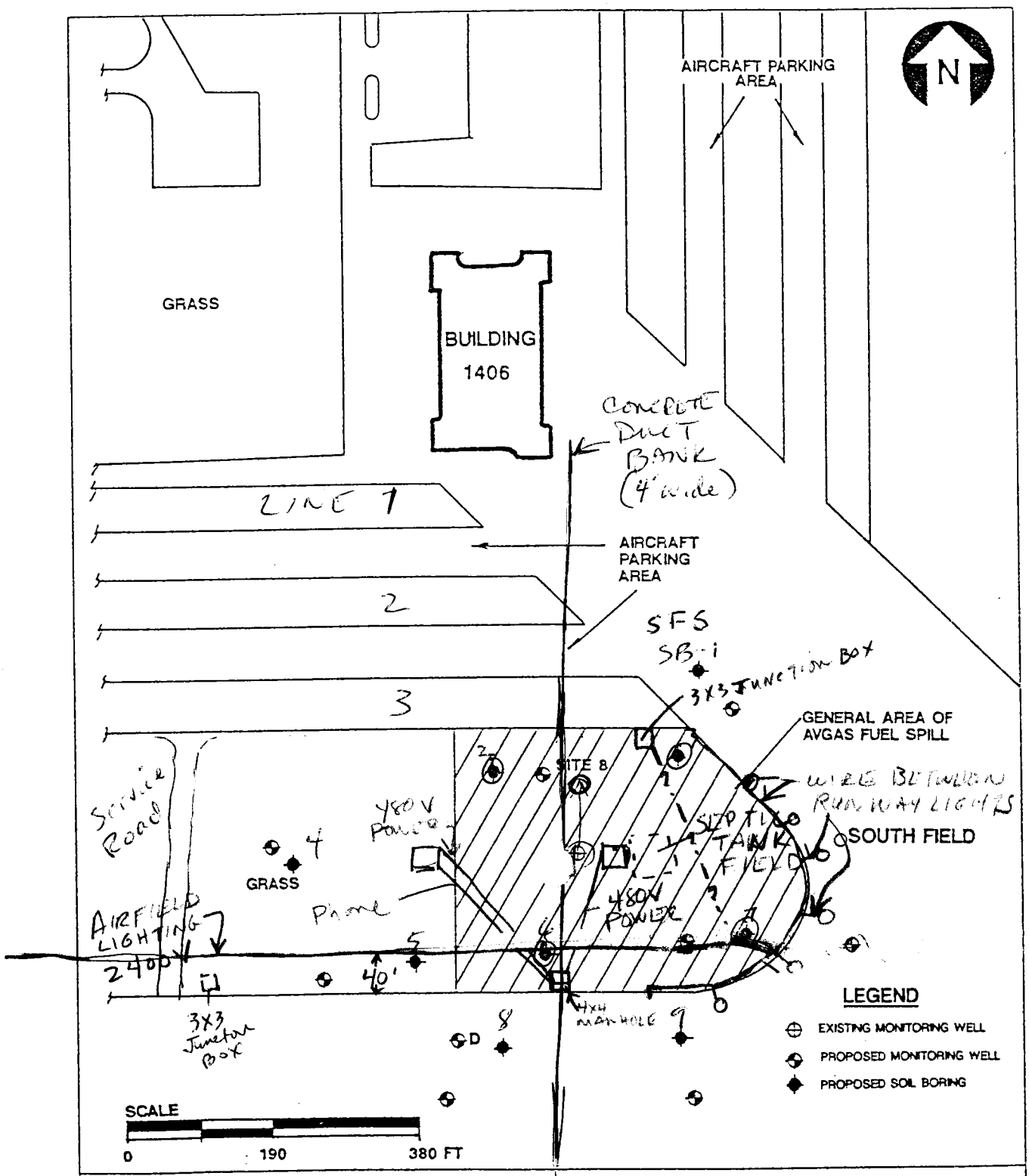


FIGURE 7

OLD AVGAS FUEL SPILL SITE

ODO - 7597
Ray Johnson
Gary Spence

CONTAMINATION ASSESSMENT PLAN
NAS WHITING FIELD
MILTON, FLORIDA

71446 (Randy Cabaniss)

Base Exchange Station: 6 shallow monitoring wells
1 deep monitoring well

AVGAS Spill Site: 8 shallow monitoring wells
1 deep monitoring well

The monitoring wells will be constructed of 4-inch inside diameter (ID), schedule 40, flush-threaded, polyvinyl chloride (PVC) screen and casing. Screen length will be 10 to 20 feet with a slotted screen opening of 0.010 inch. At least 2 feet of screen will be placed above the water table to accommodate seasonal fluctuations of the water table. The screen will be surrounded with a quartz sand filter pack of 6/20 size (or of an acceptable equivalent) to at least 2 feet above the top of the screen. A 2-foot bentonite or acceptable equivalent seal will be placed above the filter pack. The remaining annulus will be grouted to the ground surface with neat cement. A locking, watertight cap will be installed on each well. The monitoring wells will be finished below grade in a subsurface vault and protected with a metal manhole assembly and traffic bearing cover. A diagram of a typical monitoring well, finished below grade, is illustrated in Figure 8.

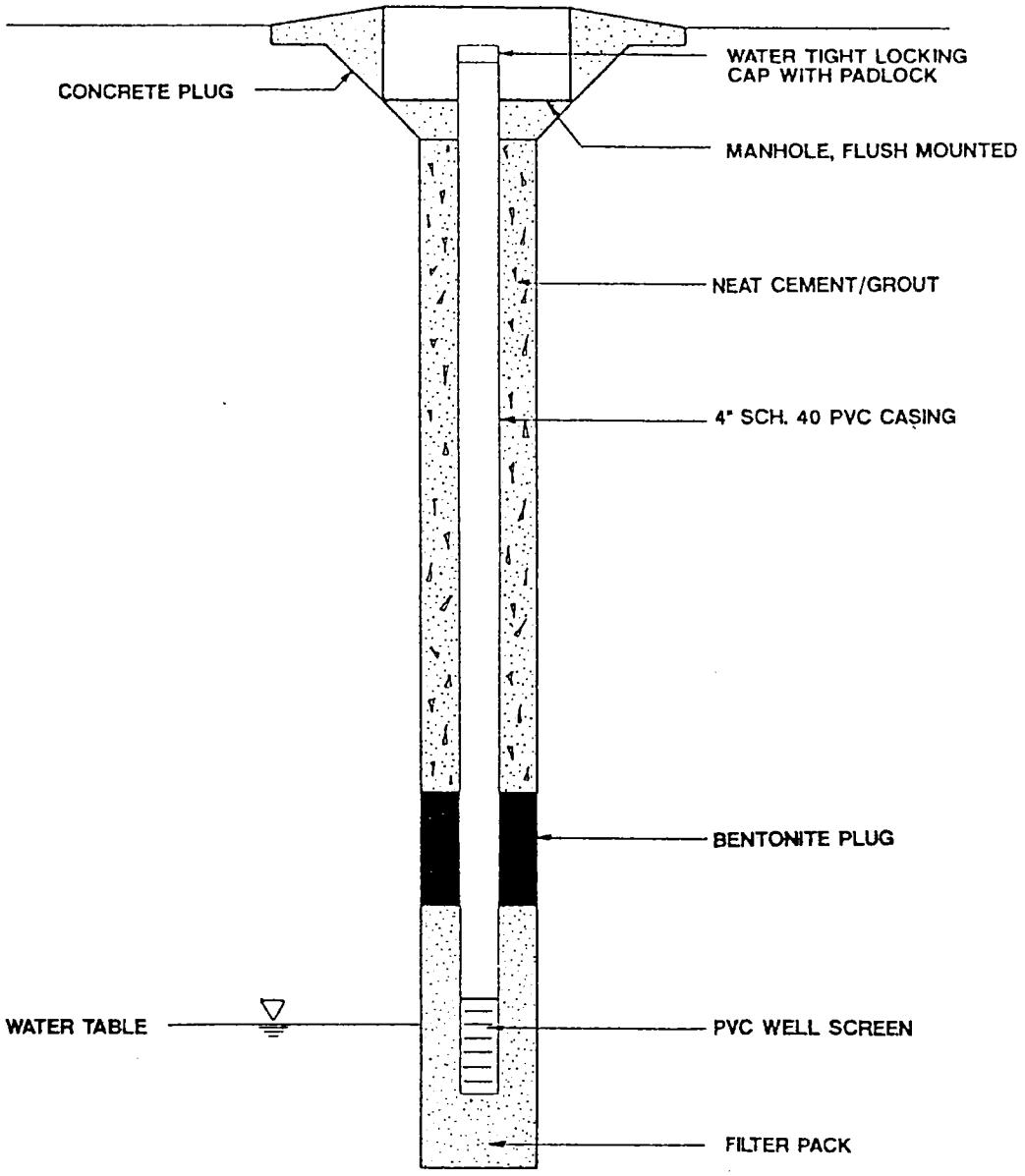
Detailed information of monitoring well construction, lithologic descriptions, split-spoon samples, and other pertinent data will be graphically displayed in boring logs. These data will be included in the CAR. Soils will be classified in accordance with the Unified Soil Classification System.

Upon completion, all newly installed monitoring wells will be developed by pumping or bailing until the purged water is clear and relatively free of sediment to assure a good hydraulic connection with the surrounding aquifer. Aquifer tests will be conducted to estimate the hydraulic properties of the water table aquifer at the site. Rising head slug tests will be performed on a minimum of two wells at each site to collect data for calculating hydraulic conductivities. Hydraulic conductivities will be calculated by using ABB-ES's in-house computer program AQTESOLV™ (Geraghty & Miller, Inc., 1989). A measuring point for groundwater elevation will be established at the top-of-casing of each well. A Florida-licensed professional surveyor will survey the horizontal and vertical coordinates for each of the monitoring wells relative to either the U.S. Geological Survey (USGS) North America Datum (NAD) 1927 or the base coordinate grid system.

Groundwater samples will be collected from the new monitoring wells that do not contain free-floating petroleum product. The following is a listing of samples that will be collected at each of the sites.

North Fuel Farm: 11 monitoring well samples, 6 existing monitoring well samples, 2 duplicate samples, 1 field blank, 1 equipment blank, and 4 trip blanks will be collected for analysis of the kerosene analytical group.

South Fuel Farm: 17 monitoring well samples, 2 duplicate samples, 1 field blank, 1 equipment blank, and 4 trip blanks will be collected for analysis of the kerosene analytical group.



NOT TO SCALE

FIGURE 8

TYPICAL MONITORING WELL INSTALLATION DETAIL

CONTAMINATION ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

Base Exchange Service Station: - 7 monitoring well samples, 1 duplicate sample, 1 field blank, 1 equipment blank, and 2 trip blanks will be collected for analysis of the gasoline analytical group.

AVGAS Spill Site: 9 monitoring well samples, 1 duplicate sample, 1 field blank, 1 equipment blank, and 2 trip blanks will be collected for analysis of the gasoline analytical group.

Groundwater samples will be collected with Teflon™ bailers and shipped via overnight carrier to an approved analytical laboratory. Sampling and the subsequent analytical program will comply with the ABB-ES FDER-approved Comprehensive Quality Assurance Plan (CompQAP). All groundwater samples will be analyzed for the parameters found in the FDER Chapter 17-770, FAC, for either the gasoline analytical group or the kerosene analytical group.

During the Phase I and Phase II field investigation, ABB-ES personnel and their subcontractors will coordinate efforts with site personnel to dispose of contaminated fluids and soils onsite. No drums will be supplied by ABB-ES or the subcontractors. It will be the Navy's responsibility to dispose of any hazardous waste.

4.2 PREPARATION OF REPORTS. Upon completion of the Phase II field investigation and receipt of the laboratory analytical results of the groundwater samples; draft, draft final, and final Contamination Assessment Reports (CARs) will be prepared for each site and submitted to SDIV and the Naval activity for review and approval. The reports will discuss site background information, site conditions, findings, and recommendations for the four sites at NAS Whiting Field. Recommendations will also be made as to the need for any follow-up reports. Site location maps, locations of monitoring wells, groundwater contour maps, and contamination delineation maps will be included with the reports.

Based on the findings, conclusions, and recommendations of the final CARs; draft (90 percent), draft-final (100 percent), and final follow-up reports will be prepared for the four sites at NAS Whiting Field. The reports shall be either No Further Action Proposals (NOFAPs), Monitoring Only (MO) Proposals, or Remedial Action Plans (RAPs).

For the purpose of estimating project costs , it will be assumed that a RAP will be developed for the four sites. The RAP will include the following items:

- summary sheet of the Contamination Assessment Report;
- general discussion of the technical and economic feasibility of remedial alternatives and a more detailed analyses of the recommended remedial system;
- general discussion of the rationale for the selected system;
- comparison of contaminant levels found with existing State cleanup criteria in tabular format;

- disposition and expected contamination concentrations in any effluent from the proposed cleanup method;
- cost estimates and anticipated schedules for the design, construction startup, and operation phases;
- designation of monitoring wells and proposed methodology for verifying accomplishment of RAP goals (cleanup levels);
- general discussion of the treatment of contaminated soils;
- design of a remedial action system including non-construction grade drawings; and
- recommendations for conducting a pilot study (if required) prior to preparation of the RAP and obtaining additional information.

The RAP, as described herein, is intended to fulfill the Remedial Action Plan requirements of FDER Chapter 17.770, FAC.

It is ABB-ES' understanding that Southern Division will further contract to develop construction documents which may include:

performance specifications; or

construction drawings, bid documents, and technical specifications.

The CAR and RAP developed under this contract will not meet the requirements of the Navy Standard Specification P-141 (Guide for Architectural and Engineering Firms performing services for the Southern Division Naval Facilities Engineering Command). Although these documents will provide some of the information necessary to develop performance specifications, neither document will be biddable. Additional site information that may be needed to develop the performance specifications but are not included in this scope is as follows:

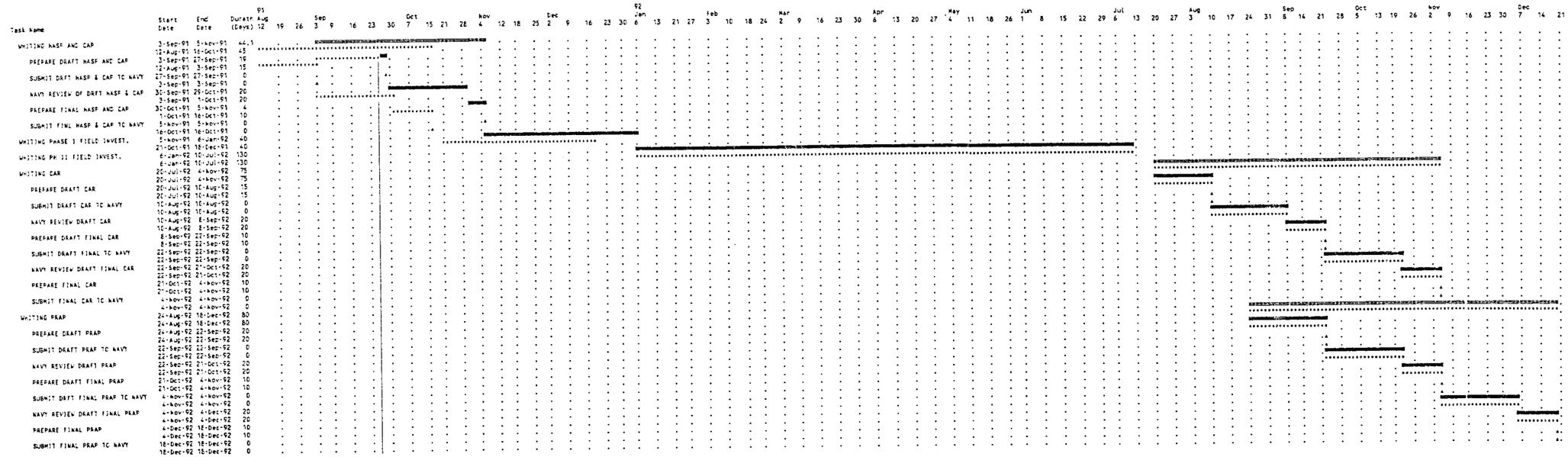
- existing conditions site survey plans,
- locations of existing utilities, and
- location and availability of electric power.

5.0 SCHEDULE

A projected schedule to complete the Contamination Assessment field investigation program at NAS Whiting Field is approximately 8 weeks for Task I and 26 weeks for Task II, based upon ABB-ES's understanding of the field investigation requirements. This schedule includes mobilization, drilling of soil borings, installation of groundwater monitoring wells, sampling, surveying, aquifer testing, and demobilization. The field investigation work has been scheduled to begin the week of November 4, 1991. It should be noted that because of operational requirements, work at the AVGAS spill site may be limited to weekends or holidays. Upon completion of the field investigation, approximately 3 weeks will be required before receipt of the laboratory analyses of groundwater samples collected during the Phase II investigation. A draft Contamination Assessment Report for each site will be prepared and submitted to SDIV by August 10, 1992. If time schedules for report review are followed, draft follow-up reports have been scheduled to be delivered to SDIV by September 22, 1992. A Gantt Chart outlining the project schedule is presented as Figure 9.

SCHEDULE

Task Name	Start Date	End Date	Duration (Days)
WHITING NASF AND CAP	3-Sep-91	5-Nov-91	44.1
PREPARE DRAFT NASF AND CAP	12-Aug-91	16-Oct-91	45
SUBMIT DRFT NASP & CAF TO NAVY	3-Sep-91	27-Sep-91	16
NAVY REVIEW OF DRFT NASF & CAP	27-Sep-91	27-Sep-91	0
PREPARE FINAL NASF AND CAP	3-Sep-91	3-Sep-91	0
SUBMIT FINL NASP & CAP TO NAVY	30-Sep-91	29-Oct-91	20
WHITING PHASE I FIELD INVEST.	3-Sep-91	1-Oct-91	20
WHITING PH II FIELD INVEST.	30-Oct-91	5-Nov-91	4
WHITING CAR	1-Oct-91	16-Oct-91	10
PREPARE DRAFT CAR	5-Nov-91	5-Nov-91	0
SUBMIT DRAFT CAR TO NAVY	16-Oct-91	16-Oct-91	0
NAVY REVIEW DRAFT CAR	5-Nov-91	6-Jan-92	40
PREPARE DRAFT FINAL CAR	21-Oct-91	18-Dec-91	40
SUBMIT DRAFT FINAL TO NAVY	6-Jan-92	10-Jul-92	130
NAVY REVIEW DRAFT FINAL CAR	6-Jan-92	10-Jul-92	130
PREPARE FINAL CAR	20-Jul-92	4-Nov-92	75
SUBMIT FINAL CAR TO NAVY	20-Jul-92	4-Nov-92	75
WHITING PRAP	20-Jul-92	10-Aug-92	15
PREPARE DRAFT PRAP	20-Jul-92	10-Aug-92	15
SUBMIT DRAFT PRAP TO NAVY	10-Aug-92	10-Aug-92	0
NAVY REVIEW DRAFT PRAP	10-Aug-92	10-Aug-92	0
PREPARE DRAFT FINAL PRAP	10-Aug-92	8-Sep-92	20
SUBMIT DRFT FINAL PRAP TO NAVY	10-Aug-92	8-Sep-92	20
NAVY REVIEW DRAFT FINAL PRAP	8-Sep-92	22-Sep-92	10
PREPARE FINAL PRAP	8-Sep-92	22-Sep-92	10
SUBMIT FINAL PRAP TO NAVY	22-Sep-92	22-Sep-92	0
	22-Sep-92	22-Sep-92	0
	22-Sep-92	21-Oct-92	20
	22-Sep-92	21-Oct-92	20
	21-Oct-92	4-Nov-92	10
	21-Oct-92	4-Nov-92	10
	4-Nov-92	4-Nov-92	0
	4-Nov-92	4-Nov-92	0
	24-Aug-92	18-Dec-92	80
	24-Aug-92	18-Dec-92	80
	24-Aug-92	22-Sep-92	20
	24-Aug-92	22-Sep-92	20
	22-Sep-92	22-Sep-92	0
	22-Sep-92	22-Sep-92	0
	22-Sep-92	21-Oct-92	20
	22-Sep-92	21-Oct-92	20
	21-Oct-92	4-Nov-92	10
	21-Oct-92	4-Nov-92	10
	4-Nov-92	4-Nov-92	0
	4-Nov-92	4-Dec-92	20
	4-Nov-92	4-Dec-92	20
	4-Dec-92	18-Dec-92	10
	4-Dec-92	18-Dec-92	10
	18-Dec-92	18-Dec-92	0
	18-Dec-92	18-Dec-92	0



LEGEND

Detail Task
(Progress)
(Slack)
Summary Task
(Progress)
(Slack)
Baseline
Conflict
Resource delay
Milestone
Progress shows Percent Achieved on Actual
Scale: 8 hours per character

FIGURE 9
NAS WHITING FIELD PROJECT
GANTT CHART

CONTAMINATION ASSESSMENT PLAN

NAS WHITING FIELD
MILTON, FLORIDA

REFERENCES

ABB Environmental Services Inc., 1991, Documentation Support for Hazard Ranking System II Scoring, Naval Air Station, Whiting Field, Milton, Florida.

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Marsh, O.T., 1966, Geology of Escambia and Santa Rosa Counties, Western Florida Panhandle: Florida Bureau of Geology, Bulletin No. 46, 140 p.

Naval Energy and Environmental Support Activity, 1985, Initial Assessment Study of Naval Air Station Whiting Field, Milton, Florida: NEESA 13-072.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

FOR

CONTAMINATION ASSESSMENT INVESTIGATION
NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

CTO NO.: 0009

Contract Number N62467-89-D-0317

Prepared by:

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Naval Facilities Engineering Command
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OCTOBER 1991

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Site Specific Health and Safety Plan

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Site Specific Health and Safety Plan

REFERENCES

The following chapters of the Comprehensive Long-term Environmental Action Navy (CLEAN) Program District I Generic Health and Safety Plan (HASP) are applicable for the work anticipated at the site:

- ✓ 2.0 AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL
- ✓ 3.0 TRAINING PROGRAM
- ✓ 4.0 MEDICAL SURVEILLANCE PROGRAM
- ✓ 5.0 ENGINEERING CONTROLS
- ✓ 6.0 PERSONAL PROTECTIVE LEVEL DETERMINATION
- ✓ 7.0 MONITORING EQUIPMENT
- ___ 8.0 ZONATION
- ✓ 9.0 WORK PRACTICES
- ___ 10.0 CONFINED SPACE ENTRY PROCEDURES
- ___ 11.0 EXCAVATION AND TRENCHING
- ✓ 12.0 TEMPERATURE EXTREMES
  - ✓ HEAT STRESS
  - ___ COLD STRESS
- ✓ 13.0 DECONTAMINATION
- ✓ 14.0 EMERGENCY PLANNING
- ✓ 15.0 HEALTH AND SAFETY FORMS AND DATA SHEETS
  - ___ HEALTH AND SAFETY AUDIT FORM
  - ✓ ACCIDENT REPORT FORM
  - ✓ HEALTH AND SAFETY OFFICER (HSO) CHECKLIST FOR FIELD OPERATIONS
  - ✓ MATERIAL SAFETY DATA SHEETS
  - ___ LIQUI-NOX
  - ___ ETHYL ALCOHOL (denatured)
  - ___ TRISODIUM PHOSPHATE
  - ✓ OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) POSTER
  - ✓ DAILY HEALTH AND SAFETY AUDIT FORM

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Site Specific Health and Safety Plan

REFERENCES (continued)

1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the Navy CLEAN Program District I (CLEAN) HASP and is intended to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, the HASP addresses those activities associated with field operations for this project. Compliance with this HASP is required for all ABB-ES personnel, contractor personnel, or third parties entering the site.

1.2 PROJECT PERSONNEL.

1.2.1 Project Manager The project manager (PM) is the individual with overall project management responsibilities. Those responsibilities as they relate to health and safety include provision for the development of this site-specific HASP, the necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements, and the means and materials necessary to resolve any health and safety issues that are identified or that develop on the project.

1.2.2 General Site Supervisor The General Site Supervisor is either the PM or the PM's designee who is on-site and vested with the authority by the PM to carry out day-to-day site operations, including interfacing with the site Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The HSO for this project has been designated by the PM with concurrence of the Health and Safety Supervisor (HSS) or Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM through the HSS for the duration of his/her assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the CLEAN HASP. The HSO will investigate all accidents, illnesses, and incidents occurring on-site. The HSO will also conduct safety briefings and site-specific training for on-site personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting an ABB-ES site in response to health and safety issues. The HSO, in consultation with the HSS or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.3 TRAINING. Training is defined under the CLEAN HASP, and all personnel entering potentially contaminated areas of this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 3.0 of the CLEAN HASP for further information.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the CLEAN HASP. Personnel who have not received medical clearance **will not be permitted** in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 4.0 of the CLEAN HASP for further information.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. The U.S. Naval Air Station (NAS) at Whiting Field is located just north of Milton, Florida, which is 10 miles northeast of Pensacola. NAS Whiting Field presently occupies a 3,490-acre tract of land, with easement rights to an additional 457 acres. The station is currently the home base of Training Air Wing Five (TRAWING FIVE), whose mission is to administer, coordinate, and supervise flight and academic training. The station is divided into a North Field, where fixed wing training takes place, and a South Field used for helicopter training. Support facilities are located between the two fields.

The project comprises four separate sites within the base.

2.2 SITE HISTORY AND LAYOUT. The following is background information on the four sites at NAS Whiting Field where contamination assessments will be preformed.

Facility 1467, North Fuel Farm. The site is located north of Tow Lane and contains eight steel, underground storage tanks (USTs) that were installed in 1943. The tanks are 25,000-gallon tanks and presently contain water, diesel fuel, unleaded gasoline, and water contaminated JP-5 jet fuel. During tank cleaning operations from 1943 to 1968, sludge from the tanks was disposed of at the site. An estimated 25 to 30 gallons of sludge was disposed of from each tank during cleaning operations. Typically, a trench was excavated next to a tank and sludge was placed into it and covered. Previous Initial Assessment Studies (IAS) indicated that lead contamination exists at the site. Groundwater samples from a nearby 152-foot-deep monitoring well showed low levels of benzene and toluene.

Facility 1466, South Fuel Farm. The site is located at the south end of Ranger Street and contains eight steel, 25,000-gallon USTs that presently contain water and heating oil. The tanks were installed in 1943. The same sludge disposal practices were used at the South Fuel Farm as at the North Fuel Farm and over the same period of time.

Facility 2866, Navy Exchange Service Station. The site contains three 10,000-gallon USTs that are constructed of steel and were installed in the 1950's. An attempt was made to precision test the tanks in October 1989. Tank 2866-A tested tight, but tanks 2866-B and 2866-C failed because of leaks at the seals on the manway ports. The tanks have since been repaired and have tested tight. During the excavation to the manway ports and vent lines, a petroleum odor was detected in the soils around the manways and vent lines.

Old AVGAS Fuel Spill Site. The site is an Installation Restoration site (No. 8) and is located south of building 1406 on the South Field runway. In the summer of 1972, 25,000 gallons of AVGAS were spilled at the site when a rubber fuel line broke and leaked over a 36-hour period during a 3-day weekend. The fuel flowed to a grassy area where it pooled over a 2-acre area.

2.3 SCOPE OF WORK (WORK PLAN). ABB-ES will conduct a contamination assessment investigation at each of the four sites on the base. The assessment will include soil borings, and the installation and sampling of monitoring wells. The work will be conducted in Level D protective wear. Soil samples and groundwater samples will be collected during the course of the investigation for screening on an organic vapor analyzer (OVA) and a portable gas chromatograph (GC) for petroleum constituents.

3.0 TASK ANALYSIS

3.1 TASK ONE.

3.1.1 Hazardous Substances The contaminants of concern known or suspected to be present on-site, along with established exposure limits for those substances, are listed in Table 3-1.

3.1.2 Site Risks The following are the health hazards and safety hazards that are expected to be encountered at the site.

3.1.2.1 **Health Hazards** Contaminants to which personnel may be exposed are JP-5 jet fuel, diesel fuel, gasoline, and their constituents. The primary constituents of the petroleum products that will be encountered that represent potential health hazards are described below and summarized in Table 3-1.

BENZENE is a colorless liquid with a pleasant aromatic odor. It is a moderate irritant in small amounts both as a gas and as a liquid. If inhaled in large amounts it attacks the central nervous system, possibly resulting in coma and/or respiratory arrest. Chronic poisoning causes leukemia.

ETHYL BENZENE is a colorless aromatic liquid. It is a moderate skin irritant in gaseous form. Inhalation of high concentrations of the gas may cause temporary irritation of the nose, dizziness, and depression. The liquid form can blister the skin if not washed off immediately.

TOLUENE is a colorless liquid with a pleasant aromatic odor. It is a mild skin irritant. Inhalation of high concentrations of the gas can cause temporary smarting of the eyes or irritation of the respiratory system. If the liquid form is allowed to remain on the skin for a long period of time, smarting and reddening of the skin may occur. Ingestion or aspiration of the liquid causes depressed respiration and pulmonary edema, and can result in kidney or liver damage.

XYLENE is a colorless, liquid with a sweet odor. It is a moderate skin irritant. When present as a gas in high concentrations, it can cause temporary slight smarting of the eyes or irritation of the respiratory system, headache, and dizziness. The liquid form may cause smarting or reddening of the skin if not washed off immediately. If the liquid is aspirated into the lungs it can result in severe coughing, distress, and rapidly developing pulmonary edema. If ingested, nausea, vomiting, cramps, headache, and coma can occur and may be fatal. Ingestion may also result in kidney and liver damage.

POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs), for the purposes of this plan and study, include those listed as parameters for USEPA Method 610. Some of the more notable PAHs from this method include acenaphthene, anthracene, chrysene, fluorene, naphthalene, phenanthrene, and pyrene. Details of these compounds are listed in Section 4.0.

Table 3-1
Contaminants of Concern

Site Specific Health and Safety Plan
Naval Air Station, Whiting Field
Milton, Florida

Chemical	Approximate odor threshold (ppm)	Permissible Exposure Limits (ppm)	Threshold Limit Value (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Benzene	4.7	1	1	Colorless liquid, pleasant aromatic odor.	Moderate skin irritant.	Inhalation of large amounts attacks central nervous system (CNS); chronic poisoning causes leukemia.
Ethyl benzene	140	100	100	Colorless liquid, aromatic odor.	Moderate skin irritant.	Liquid blisters skin; inhalation results in dizziness, depression.
Toluene	0.17	100	100	Colorless liquid, pleasant aromatic odor.	Mild skin irritant.	Ingestion or aspiration can cause pulmonary edema, depressed respiration, and kidney and liver damage.
Xylene	0.05	100	100	Colorless liquid, aromatic odor.	Moderate skin irritant.	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.
Naphthalene	--	10	10	Colorless to brown solid with an odor of mothballs.	Moderate skin irritant.	Inhalation causes headache and confusion; vapors irritate eyes.
Lead	--	--	--	Soft, ductile, gray, metal, soluble in water containing a weak acid.	--	Lead poisoning may cause fatigue, anemia, abdominal pains, and neurological damage.

Notes: ppm = parts per million.

All activities at this site will be conducted in unconfined areas. This will minimize the chances of exposure of on-site personnel to either high vapor concentrations or strong liquid concentrations of any of the substances described above.

3.1.2.2 **Safety Hazards** Safety hazards include those hazards to which personnel may be exposed that are unrelated to hazardous wastes. These include hazards such as heat stress, snake bites, operation and presence around heavy equipment, lifting of objects, and vehicle traffic. Extreme caution should be practiced by all personnel while conducting work around drill rigs, backhoes, and other heavy equipment. During hot days, personnel should take time to drink fluids and cool off to avoid overheating and symptoms related to heat stress.

Lifting of heavy objects should be done with caution. Personnel should assist one another with moving heavy objects or use the appropriate equipment to accomplish these tasks. During all site activities, personnel should be aware of the possibility of an encounter with poisonous snakes, particularly rattlesnakes.

Power substations, powerlines, underground utilities, and underground pipelines are to be avoided during drilling operations. Information on underground utilities and scheduling of the field work at the facility will be coordinated with Mr. Danny Locklear, the Utility Engineer at NAS Whiting Field.

3.1.2.3 **Conclusions and Risk Assessment** Based on all of the available information (nature of the work, potential onsite chemicals and their properties, exposure limits, etc.), hazards associated with conducting the described field work are considered to be low, assuming appropriate health and safety practices are maintained.

3.1.3 Protective Measures The following are the protective measures that will be used at the site.

3.1.3.1 **Engineering Controls** Whenever needed, engineering controls (i.e., fans to blow volatilized chemicals away from the work area) will be used.

3.1.3.2 **Levels of Protection** A level D work uniform will be used at the site. Level D Protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

3.1.4 Monitoring It is intended that real time monitoring instrumentation will be used to monitor the work environment in order to ensure the appropriate level of protection for the site team.

3.1.4.1 **Air Sampling** To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO.

The following sampling equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

1. Organic Vapor Analyzer (OVA)

If the OVA detects a steady measurable quantity of organic vapors greater than 5 parts per million (ppm) in the breathing zone, the field team will withdraw from the site until health and safety conditions at the site are reevaluated.

3.1.4.2 **Personal Monitoring** Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter on-site. Personal monitoring will be conducted on a representative basis. Personnel who are represented by the sampling will be noted in field logs.

The following personal monitoring equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the maintenance and calibration of the equipment.

1. Thermoluminescent Dosimetry Body Badge

4.0 DATA SHEETS

BENZENE

BNZ

Common Synonyms	Watery liquid	Colorless	Gasoline-like odor
Benzol Benzole	Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Restrict access

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic Hydrocarbon
3.2 Formula: C_6H_6
3.3 IMO/UN Designation: 3.2/1114
3.4 DOT ID No.: 1114
3.5 CAS Registry No.: 71-43-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Aromatic, rather pleasant aromatic odor, characteristic odor

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.
5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, Coma and possible death.
5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
5.4 Threshold Limit Value: 10 ppm
5.5 Short Term Inhalation Limits: 75 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 Late Toxicity: Leukemia
5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 4.68 ppm
5.11 IDLH Value: 2,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 12°F C.C.
6.2 Flammable Limits in Air: 1.3%-7.9%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 Ignition Temperature: 1097°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 6.0 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 32

8. WATER POLLUTION

8.1 Aquatic Toxicity:
5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/TL_m/tap water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity:
Industrial pure .....99+%
Thiophene-free .....99+%
Nitration .....99+%
Industrial 90% .....85+%
Reagent .....99+%
9.2 Storage Temperature: Open
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Flammable liquid
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 78.11
12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K
12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K
12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K
12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m²
12.7 Specific Gravity: 0.879 at 20°C (liquid)
12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 2.7
12.11 Ratio of Specific Heats of Vapor (Gas): 1.061
12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94×10^5 J/kg
12.13 Heat of Combustion: −17,460 Btu/lb = −9698 cal/g = -406.0×10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 30.45 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 3.22 psia

NOTES

o-CRESOL

CRO

Common Synonyms	Solid crystals or liquid Colorless to yellow Sweet tarry odor
o-Hydroxytoluene 2-Methylphenol o-Toluol 2-Cresol	Sinks and mixes slowly with water.

Avoid contact with liquid or solid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Notify local health and pollution control agencies.
Isolate and remove discharged material.

Fire

COMBUSTIBLE
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water fog, dry chemical, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID OR SOLID
Will burn skin and eyes.
Poisonous if swallowed, inhaled or if skin is exposed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-water contaminant, poison.
Restrict access
Should be removed.
Chemical and physical treatment

2. LABEL

2.1 **Category:** Corrosive
2.2 **Class:** 8

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Phenols, cresols
3.2 **Formula:** $CH_3C_6H_4OH$
3.3 **IMO/UN Designation:** 6.1/2076
3.4 **DOT ID No.:** 2076
3.5 **CAS Registry No.:** 95-48-7

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Solid or liquid
4.2 **Color:** Colorless to yellow.
4.3 **Odor:** Phenolic, tarry

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Chemical goggles or face shields, full protective clothing including boots and gloves, and respiratory protective apparatus.
5.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Central nervous system depression, muscular weakness, gastroenteric disturbances, convulsions and death. EYES: can cause burns. SKIN: Corrosive action may produce severe burns.
5.3 **Treatment of Exposure:** Call a doctor. INHALATION: Move to fresh air. Oxygen inhalation for respiratory distress. If needed, give artificial respiration. EYES: Irrigate with copious quantities of running water for 15 min. Hold eyelids open. If physician not available irrigate for an additional 15 min. SKIN: Remove all contaminated clothing. Wash with soap and water until all odor is gone. Then wash contaminated areas with alcohol or glycerin. Then use more water. INGESTION: Drink large quantities of liquid (salt water, weak sodium bicarbonate solution, milk or gruel) followed by demulcent such as raw egg white or corn starch paste. Induce vomiting, if not spontaneous. Keep up until vomitus is free of Cresol odor.
5.4 **Threshold Limit Value:** 5 ppm. Skin absorption can contribute to exposure.
5.5 **Short Term Inhalation Limits:** 10 ppm.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 - 500 mg/kg.
5.7 **Late Toxicity:** May produce neoplasms or act as tumor promotors. Central nervous system damage. Chronic gastritis, possible liver and kidney damage, and lesions of heart and brain. Dermatitis may result.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
5.10 **Odor Threshold:** 0.65 ppm detection in water 0.26 ppm recognition in air.
5.11 **IDLH Value:** 250 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 178°F C.C.
6.2 **Flammable Limits in Air:** 1.35%
6.3 **Fire Extinguishing Agents:** Water may be used to blanket fire, CO_2, dry chemical, foam, water spray.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Emits highly toxic fumes.
6.6 **Behavior in Fire:** Vapors form explosive mixtures with air.
6.7 **Ignition Temperature:** 1110°F.
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Will not occur.
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 21

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 49.1-19 ppm/24-96 hr/goldfish/TL_m/soft water 22.2-20.8 ppm/24-96 hr/bluegill/TL_m/soft water 18-13.4 ppm/24-96 hr/fathead minnow/TL_m/hard water 18-50 ppm/24-96 hr/guppy/TL_m/hard water
8.2 **Waterfowl Toxicity:** Chronic water fowl toxic limit is 25 ppm.
8.3 **Biological Oxygen Demand (BOD):** 1.64 lb/lb, 5 days.
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 80-98% containing 2-20% phenol. 99.2% with 0.2% phenol and 0.6% meta and para isomers.
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

SS

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Corrosive material
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Solid
12.2 **Molecular Weight:** 108.134.
12.3 **Boiling Point at 1 atm:** 376°F = 191°C = 464.2°K
12.4 **Freezing Point:** 88°F = 31°C = 304.2°K
12.5 **Critical Temperature:** 795.9°F = 424.4°C = 697.6°K
12.6 **Critical Pressure:** 726.0 psia = 49.4 atm = 5.00 MN/m^2
12.7 **Specific Gravity:** 1.05 at 20°C.
12.8 **Liquid Surface Tension:** 40.3 dynes/cm = 0.0403 N/m at 20°C.
12.9 **Liquid Water Interfacial Tension:** 32.7 dynes/cm = 0.0327 N/m at 20°C.
12.10 **Vapor (Gas) Specific Gravity:** 3.72.
12.11 **Ratio of Specific Heats of Vapor (Gas):** >1.
12.12 **Latent Heat of Vaporization:** 178.4 Btu/lb = 99.12 cal/g = 4.15×10^5 J/kg.
12.13 **Heat of Combustion:** —13994 Btu/lb = —7774 cal/g = -325×10^5 J/kg.
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Data not available

NOTES

ETHYLBENZENE

ETB

Common Synonyms	Liquid	Colorless	Sweet, gasoline-like odor
Phenylethane EB	Floats on water. Flammable, irritating vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic hydrocarbon
3.2 **Formula:** $C_6H_5CH_2CH_3$
3.3 **IMO/UN Designation:** 3.3/1175
3.4 **DOT ID No.:** 1175
3.5 **CAS Registry No.:** 100-41-4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles.
5.2 **Symptoms Following Exposure:** Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.
5.3 **Treatment of Exposure:** INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly, if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 200 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 **Odor Threshold:** 140 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 80°F O.C.; 59°F C.C.
6.2 **Flammable Limits in Air:** 1.0%-6.7%
6.3 **Fire Extinguishing Agents:** Foam (most effective), water fog, carbon dioxide or dry chemical.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.
6.7 **Ignition Temperature:** 860°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 5.8 mm/min.
6.10 **Adiabatic Flame Temperature:** Data Not Available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data Not Available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 29 ppm/96 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 2.8% (theor.), 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 106.17
12.3 **Boiling Point at 1 atm:** 277.2°F = 136.2°C = 409.4°K
12.4 **Freezing Point:** −139°F = −95°C = 178°K
12.5 **Critical Temperature:** 651.0°F = 343.9°C = 617.1°K
12.6 **Critical Pressure:** 523 psia = 35.6 atm = 3.61 MN/m²
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.2 dynes/cm = 0.0292 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 35.48 dynes/cm = 0.03548 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
12.12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.1 cal/g = 3.35 X 10^5 J/kg
12.13 **Heat of Combustion:** −17,780 Btu/lb = −9877 cal/g = −413.5 X 10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data Not Available
12.26 **Limiting Value:** Data Not Available
12.27 **Reid Vapor Pressure:** 0.4 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data Not Available
6.12 **Flame Temperature:** Data Not Available

ETHYLENE DIBROMIDE

EDB

Common Synonyms	Liquid	Colorless	Sweet odor
1, 2-Dibromoethane Ethylene bromide Bromofume sym-Dibromoethane Dow-fume 40, W-10, W-15, W-40 Glycol dibromide	Sinks in water. Poisonous vapor is produced. Freezing point is 50°F.		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED.
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $BrCH_2CH_2Br$
3.3 **IMO/UN Designation:** 6.1/1605
3.4 **DOT ID No.:** 1605
3.5 **CAS Registry No.:** 106-93-4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mildly sweet; like chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Canister type mask or self-contained air mask; neoprene gloves; chemical safety goggles.
5.2 **Symptoms Following Exposure:** Local inflammation, blisters and ulcers on skin; irritation in lungs and organic injury to liver and kidneys; may be absorbed through skin.
5.3 **Treatment of Exposure:** Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician.
5.4 **Threshold Limit Value:** 2 ppm
5.5 **Short Term Inhalation Limits:** 50 ppm for 5 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect if temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 400 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating.
6.6 **Behavior in Fire:** Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium.
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable
6.10 **Adiabatic Flame Temperature:** Data Not Available
6.11 **Stoichiometric Air to Fuel Ratio:** Data Not Available
6.12 **Flame Temperature:** Data Not Available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data Not Available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 18 mg/l/48 hr/bluegill/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** ORM-A
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 187.86
12.3 **Boiling Point at 1 atm:** 268°F = 131°C = 404°K
12.4 **Freezing Point:** 49.6°F = 9.8°C = 283.0°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 2.180 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 38.75 dynes/cm = 0.03875 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.54 dynes/cm = 0.03654 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.109
12.12 **Latent Heat of Vaporization:** 82.1 Btu/lb = 45.6 cal/g = 1.91×10^5 J/kg
12.13 **Heat of Combustion:** Not pertinent
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 13.79 cal/g
12.26 **Limiting Value:** Data Not Available
12.27 **Reid Vapor Pressure:** 0.4 psia

NOTES

JET FUELS: JP-5

JPV

Common Synonyms	Liquid	Colorless	Fuel oil odor
Kerosene, heavy	Floats on water.		

Stop discharge if possible.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not pertinent
3.3 IMO/UN Designation: 3.3/2761
3.4 DOT ID No.: 2761
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to light brown
4.3 Odor: Like fuel oil

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.
5.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.
5.4 Threshold Limit Value: 200 ppm
5.5 Short Term Inhalation Limits: 2500 mg/m³ for 60 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard: If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 1 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 140°F (min.)C.C.
6.2 Flammable Limits in Air: 0.6%-4.6%
6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 475°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

8. WATER POLLUTION

8.1 Aquatic Toxicity: 500 ppm/*/salmon fingerling/lethal/fresh water
*Time period not specified
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 53%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: 100%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Combustible liquid
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	1-2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 349-549°F = 176-287°C = 449-560°K
12.4 Freezing Point: <-54°F = <—48°C = <—225°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.82 at 15°C (liquid)
12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: 140 Btu/lb = 78 cal/g = 3.3×10^5 J/kg
12.13 Heat of Combustion: —18,540 Btu/lb = —10,300 cal/g = -431.24×10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

TETRAETHYL LEAD

TEL

Common Synonyms	Oily liquid	Colorless, but generally dyed red	Fruity odor
TEL Lead tetraethyl	Sinks in water. Poisonous, flammable vapor is produced.		

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Containers may explode in fire.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Combat fires from behind barrier or protected location.
Flood discharge area with water.
Extinguish with water, dry chemical, foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Will burn eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: Poison
2.2 Class: 6

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $Pb(C_2H_5)_4$
3.3 IMO/UN Designation: 6.1/1649
3.4 DOT ID No.: 1649
3.5 CAS Registry No.: 78-00-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Dyed red or other distinctive color.
4.3 Odor: Sweet

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor type canister face mask for short periods; air line type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots.

5.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause insomnia, excitability, delirium, coma and death. Do not confuse with inorganic lead.

5.3 Treatment of Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water.

5.4 Threshold Limit Value: 0.1 mg/m³

5.5 Short Term Inhalation Limits: 0.15 mg Pb/m³ for 30 min.

5.6 Toxicity by Ingestion: Oral rat LD_{Lo} = 17 mg/kg

5.7 Late Toxicity: Lead poisoning

5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.

5.10 Odor Threshold: Data not available

5.11 IDLH Value: 40 mg/m³

6. FIRE HAZARDS

6.1 Flash Point: 200°F C.C.; 185°F O.C.

6.2 Flammable Limits in Air: Data not available

6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires.

6.6 Behavior in Fire: May explode in fires.

6.7 Ignition Temperature: Decomposes above 230°F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: Data not available

6.10 Adiabatic Flame Temperature: Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction

7.2 Reactivity with Common Materials: Rust and some metals cause decomposition.

7.3 Stability During Transport: Stable below 230°F. At higher temperatures, may detonate or explode when confined.

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

7.7 Molar Ratio (Reactant to Product): Data not available

7.8 Reactivity Group: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: 0.20 mg/l/96 hr/bluegill/TL_m/fresh water

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical

9.2 Storage Temperature: Ambient

9.3 Inert Atmosphere: No requirement

9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Poison, B

11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	3

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid

12.2 Molecular Weight: 323.44

12.3 Boiling Point at 1 atm: Decomposes

12.4 Freezing Point: −215°F = −137°C = 136°K

12.5 Critical Temperature: Not pertinent

12.6 Critical Pressure: Not pertinent

12.7 Specific Gravity: 1.633 at 20°C (liquid)

12.8 Liquid Surface Tension: 26.5 dynes/cm = 0.0265 N/m at (est.) 25°C

12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C

12.10 Vapor (Gas) Specific Gravity: Not pertinent

12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent

12.12 Latent Heat of Vaporization: Not pertinent

12.13 Heat of Combustion: (est.) −7,870 Btu/lb = −4,380 cal/g = −183 X 10³ J/kg

12.14 Heat of Decomposition: Not pertinent

12.15 Heat of Solution: Not pertinent

12.16 Heat of Polymerization: Not pertinent

12.25 Heat of Fusion: Data not available

12.26 Limiting Value: Data not available

12.27 Reid Vapor Pressure: Data not available

6. FIRE HAZARDS (Continued)

6.11 Stoichiometric Air to Fuel Ratio: Data not available

6.12 Flame Temperature: Data not available

TOLUENE

TOL

Common Synonyms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Evacuate area

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $C_6H_5CH_3$
3.3 **IMO/UN Designation:** 3.2/1294
3.4 **DOT ID No.:** 1294
3.5 **CAS Registry No.:** 108-88-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent; aromatic, benzene-like; distinct, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 600 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.17 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 40°F C.C.; 55°F O.C.
6.2 **Flammable Limits in Air:** 1.27%-7%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 997°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.7 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor), 8 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 92.14
12.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K
12.4 **Freezing Point:** −139°F = −95.0°C = 178.2°K
12.5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K
12.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m^2
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
12.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61×10^5 J/kg
12.13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = -405.5×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 17.17 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 1.1 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

m-XYLENE

XLM

Common Synonyms	Watery liquid	Colorless	Sweet odor
3-Dimethylbenzene .ylol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Call fire department.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Evacuate area
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $m\text{-}C_6H_4(CH_3)_2$
3.3 **IMO/UN Designation:** 3.2/1307
3.4 **DOT ID No.:** 1307
3.5 **CAS Registry No.:** 108-38-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Like benzene; characteristic aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
5.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 300 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 g/kg
5.7 **Late Toxicity:** Kidney and liver damage.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.05 ppm
5.11 **IDLH Value:** 10,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C.
6.2 **Flammable Limits in Air:** 1.1%-6.4%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 986°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.8 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days: 0% (theor.), 8 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research: 99.99%; Pure: 99.9%; Technical: 99.2%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 106.16
12.3 **Boiling Point at 1 atm:** 269.4°F = 131.9°C = 405.1°K
12.4 **Freezing Point:** −54.2°F = −47.9°C = 225.3°K
12.5 **Critical Temperature:** 650.8°F = 343.8°C = 617.0°K
12.6 **Critical Pressure:** 513.8 atm = 34.95 psia = 3.540 MN/m^2
12.7 **Specific Gravity:** 0.864 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 26.6 dynes/cm = 0.0266 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 30°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
12.12 **Latent Heat of Vaporization:** 147 Btu/lb = 81.9 cal/g = 3.43×10^5 J/kg
12.13 **Heat of Combustion:** −17,554 Btu/lb = −9752.4 cal/g = -406.31×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 26.01 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.34 psia

NOTES

Diesel Oil (fuel oil No. 2)

Physical and Chemical Description: Diesel oil is a flammable, slightly viscous brown liquid obtained from the distillation of crude petroleum. Diesel oil is a mixture of hydrocarbons, predominately unbranched alkanes of 10 to 16 carbon atoms with smaller amounts of aromatic and polynuclear aromatic hydrocarbons (PAHs). Diesel oil floats on water, having a specific gravity of less than 1.

Uses: Diesel oil is used as fuel for trucks, ships, and trains.

Toxicity: Because of their water solubility and carcinogenicity, benzene and PAHs are the chemicals of health concern in diesel oil. Benzene, found in trace amounts in diesel oil, is known to cause leukemia, a cancer of the blood-forming cells. PAHs as a class (1 to 10 percent in diesel) are considered to be carcinogenic to a number of animal species. Benzo(a)pyrene is one of the most commonly found and carcinogenic PAHs. The alkanes of 10 to 16 carbon atoms, which make up the bulk of diesel oil, are of less concern due to their very low water solubility and low toxicity.

Concentration Guidelines and Standards: The maximum tolerable concentration for diesel oil in drinking water is 100 micrograms per liter (μg/l), due to organoleptic (taste and smell) considerations. The USEPA Office of Drinking Water recommends that the short-term concentrations of PAHs in drinking water not exceed 25 μg/l. This is the 7-day, suggested, no adverse response level (SNARL) and does not take into account the long-term cancer risk. these concentrations should be tolerated only in emergency situations where no other higher quality water source is available.

Naphthalene ($C_{10}H_8$)

Physical and Chemical Description: Naphthalene is a white crystalline solid with a characteristic "moth ball" odor. Naphthalene is more dense than water, with a specific gravity of 1.145, and has a solubility of 30,000 to 40,000 μg/l at 25 °C. It melts at 80 °C but will sublime (volatilize from a solid) at room temperature. Naphthalene is considered a polynuclear aromatic hydrocarbon (PAH).

Uses: Naphthalene is an intermediate in dye production and the formation of solvents, lubricants, and motor fuels. It is used directly as a moth repellant.

Toxicity: Naphthalene may be absorbed by inhalation, ingestion, or skin or eye contact. Chronic exposure can cause cataracts, kidney disease, and red blood cell breakdown, especially in infants and individuals deficient in the enzyme G6PD. Naphthalene has been shown to be nonmutagenic and noncarcinogenic.

Classification: Hazardous Substance (USEPA)
Hazardous Waste (USEPA)
Priority Toxic Pollutant (USEPA)

Persistence: Naphthalene can oxidize in the presence of light and air; 50 percent after 14 days in one study. Microbial degradation has also been demonstrated in the laboratory in solutions as concentrated as 3.3 μg/l. Little breakdown is expected, however, under the dark, anaerobic conditions characteristic of in-situ groundwater.

Phenanthrene ($C_{14}H_{10}$)

Physical and Chemical Description: Phenanthrene is a colorless, monoclinic crystal soluble in water (1,000 to 1,300 μg/l at 2.5 °C) and has a specific gravity of 1.179. Phenanthrene is a PAH.

Uses: Phenanthrene is used in dyes and explosives and is a natural constituent of coal tar and of diesel oil (0.35 percent).

Toxicity: Phenanthrene has been identified as a mild allergen and human dermal photosensitizer. Limited acute and chromic animal experiments show it to be of low to moderate toxicity.

Classification: None.

Fluorene ($C_{13}H_{10}$)

Physical and Chemical Description: Fluorene is a combustible, white solid having a density of 1.20 and a water solubility of 1,980 μg/l.

Uses: Fluorene is used in the manufacture of dyestuffs.

Toxicity: Little specific information is available about the toxicity of fluorene but it is a polynuclear aromatic hydrocarbon (PAH), a group that contains known human carcinogens.

Classification: None.

5.0 SITE CONTROL

5.1 ZONATION. Due to the nature of the work (multiple soil borings and monitoring well sampling throughout the study area) and the properties of the potential chemicals found onsite, typical exclusion, contamination reduction, and support zones are not necessary or practical at all locations. Therefore, where appropriate, a "floating" exclusion zone in the perimeter of the sampling site will be established to eliminate access to the area by individuals not working on the project or involved in the assessment work. The perimeter will be at least 20 feet in radius and moved accordingly as the assessment points are moved.

5.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)

5.3 WORK PRACTICES. General work practices to be used during ABB-ES projects are described in Chapter 9.0 of the CLEAN HASP. Work at the site will be conducted according to these established protocol and guidelines for the safety and health of all involved. Specific work practices necessary for this project or those that are of significant concern are described as follows.

- Work and sampling will be conducted in Level D clothing and equipment.

6.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination, which will take place in the contamination reduction zone. General decontamination practices used during ABB-ES projects are described in Chapter 13.0 of the CLEAN HASP.

6.1 PERSONNEL DECONTAMINATION. All personnel leaving the study area are subject to decontamination (as necessary). The decontamination procedure required will be determined by the nature and level of contamination found at the sites. At a minimum, site personnel will remove loose soils from boots and clothing before leaving the site. More thorough decontamination procedures will be observed as dictated by site conditions. These procedures are described in Chapter 13.0 of the CLEAN HASP.

6.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be field cleaned between samples with soapy water (Alconox), rinsed with clean water, rinsed with an approved Quality Assurance/Quality Control solvent, and final rinsed with organic free water. This procedure is described in the ABB-ES Tallahassee office Comprehensive Quality Assurance Plan (CompQAP).

6.1.2 Heavy Equipment Decontamination Drilling equipment will be protected from contamination as much as possible by placing the equipment on plastic sheeting, not the ground. The drill rig and associated drilling equipment will be cleaned with high pressure water or high pressure steam followed by a soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will be at the level of protection used during the field investigation.

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. All disposable protective gear, decontamination fluids (for both personnel and equipment), and other disposable materials will be disposed of at the site. Decontamination fluids will be disposed in accordance with the ABB-ES Tallahassee office CompQAP. Disposable materials (e.g., gloves and Tyveks™) will be bagged and disposed of properly.

7.0 EMERGENCY AND CONTINGENCY PLANNING

This section identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the CLEAN HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP. The following subsections present site-specific emergency and contingency planning information.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both on- and off-site will be directed through the HSO or designee.

7.2 EVACUATION. Evacuation procedures at the site will follow those procedures discussed in Chapter 14.5 of the CLEAN HASP for upwind withdrawal, site evacuation, and evacuation of the surrounding area. Evacuation will be conducted by travelling out the main gate of the base and making a left on Highway 89 toward Milton.

7.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured on-site will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 ADMINISTRATION

8.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the Project Manager and the HSS. Certification involves the completion of appropriate training, a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system, and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED ABB ENVIRONMENTAL TEAM PERSONNEL:

*+ Ken Busen	*+ Joe Daniels
*+ Peter Redfern	*+ Andrew Harvey
*+ Jay Koch	*+ Roger Durham
*+ Allan Stodghill	*+ Kelly Murray
*+ Kevin Warner	*+ Eric Blomberg
*+ Jason Bell	*+ Andy DeSandro
*+ Allen Stamp	*+ M. James Williams
*+ J. Michael Wilson	

OTHER CERTIFIED PERSONNEL:

* FIRST-AID-TRAINED
\+ CPR-TRAINED

8.2 HEALTH AND SAFETY PLAN (HASP) APPROVALS. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

Health and Safety Officer — Date: 11/1/91

Project Manager — Date: 11/1/91

Health and Safety Manager/Supervisor — Date: 11/1/91

8.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code (___) _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code (___) _____

Do you wear contact lenses? Yes ( ) No ( )

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

_____

Name of Personal Physician: _____

Telephone: Area Code (___) _____

8.5 EMERGENCY TELEPHONE NUMBERS.

Local Police Department	911
Local Rescue Service	911
Primary Hospital (Santa Rosa Medical Center)	(904) 623-9741
Alternate Hospital (West Florida Medical Center)	(904) 478-4460
Local Fire Department	911
Off-site Emergency Services	911
Poison Control Center	(800) 492-2414
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(800) 414-8802
Site HSO: M. James Williams	(904) 656-1293
General Site Supervisor: M. James Williams	(904) 656-1293
Project Manager: Peter Redfern	(904) 656-1293
ABB Environmental HSM: C.E. Sundquist	(207) 775-5401 x101

8.6 ROUTES TO EMERGENCY MEDICAL FACILITIES. The primary source of medical assistance for the site is:

Santa Rosa Medical Center
1450 Berry Hill Road
Milton, Florida 32570
(904) 623-9741

DIRECTIONS TO PRIMARY HOSPITAL:

Drive 1 mile west from the site on Highway 87A, turn left, drive 5.5 miles south on highway 89 to Berry Hill Road, turn right, travel 1.7 miles and the hospital will be on the right. (see Figure 8-1)

The alternate source of medical assistance for the site is:

West Florida Regional Medical Center
8383 N. Davis Highway
Pensacola, Florida 32514
(904) 478-4460

DIRECTIONS TO ALTERNATE HOSPITAL:

Drive 1 mile south from the site on Highway 87A, turn left, drive 6 miles south on Highway 89 to Highway 90, turn right and travel 13 miles to Davis Parkway (veer to the left). Travel 2.2 miles and the hospital is on the right side of the parkway. (see Figure 8-1)

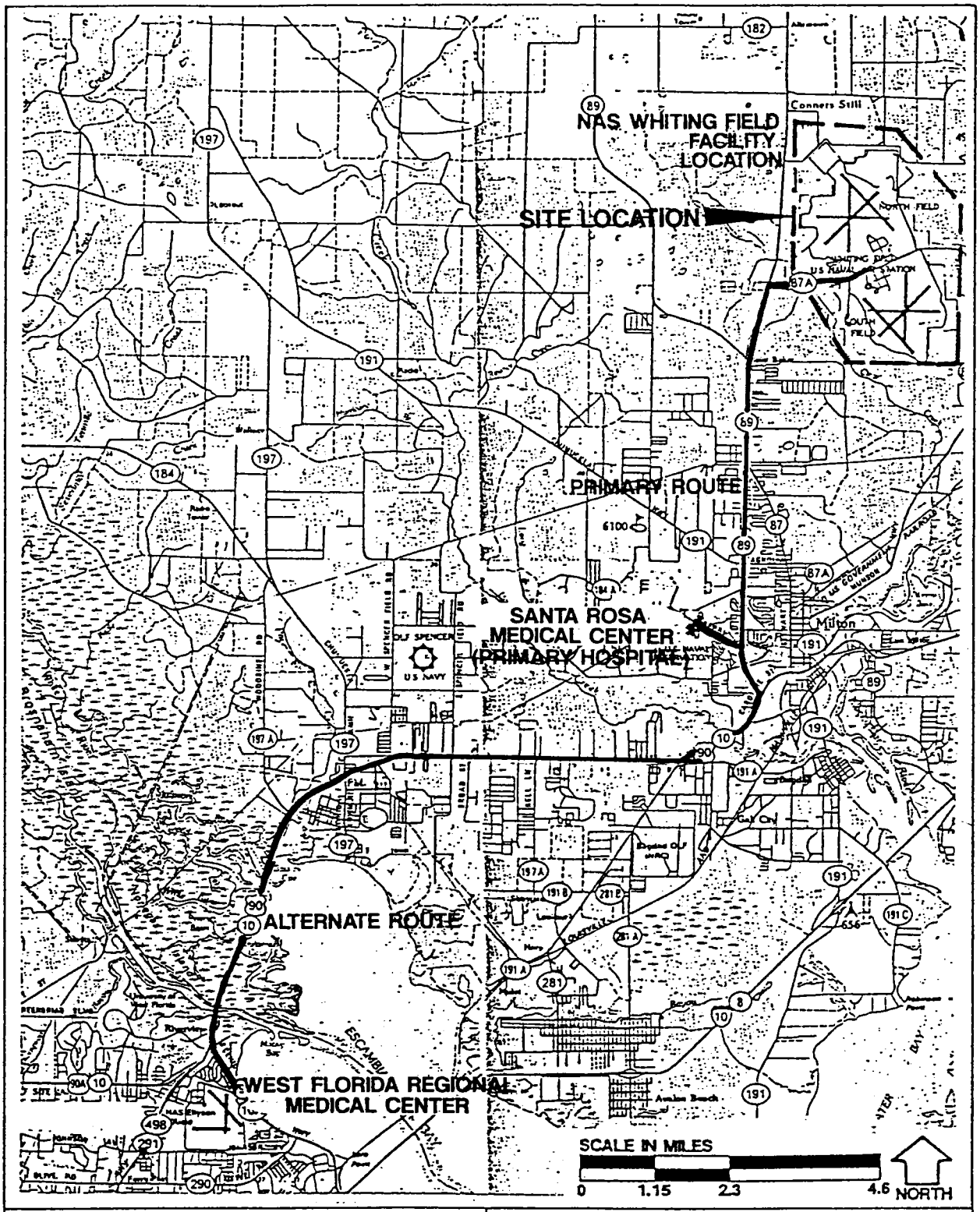

FIGURE 8-1

ROUTES TO SANTA ROSA MEDICAL CENTER AND WEST FLORIDA REGIONAL MEDICAL CENTER

HEALTH AND SAFETY PLAN

NAS WHITING FIELD
MILTON, FLORIDA

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm or employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides the employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of up to $250,000 (or $500,000 if the employer is a corporation), or by imprisonment for up to six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control emplyee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can proivde considerable help and advice on solving safety and health problems or can refer you to other sources for health such as training.

Consultation

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. Thse programs are usually administered by the State labor or Health department or a State university.

POSTING INSTRUCTIONS

Employees in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia	(404) 347-3573
Boston, Massachusetts	(617) 565-7164
Chicago, Illinois	(312) 353-2220
Dallas, Texas	(214) 767-4731
Denver, Colorado	(303) 844-3061
Kansas City, Missouri	(816) 426-5861
New York, New York	(212) 337-2325
Philadelphia, Pennsylvania	(215) 596-1201
San Francisco, California	(415) 995-5672
Settle, Washington	(206) 442-5930

Washington, D.C.
1989 (Revised)
OSHA 2203

Elizabeth Dole, Secretary of Labor

U.S. Department of Labor

Occupational Safety and Health Adminstration

Under provisions of Title 29, Code of Federal Regualtions, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

DISTRICT I

GENERIC HEALTH AND SAFETY PLAN

APPROVED FOR:

ABB ENVIRONMENTAL SERVICES, INC.

Jack Davis 3/29/91
Health and Safety Supervisor Date
Jack Davis

Raymond A. Allen 3-29-91
Program Manager Date
R. Anthony Allen, III

APPROVED BY:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

_____ _____
Program Manager Date
Jerry Hudson

_____ _____
Health and Safety Date
Manager

Copy No. _____

GENERIC HEALTH AND SAFETY PLAN

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CHAPTER 1. INTRODUCTION

1.1 PURPOSE. ABB Environmental Services, Inc. (ABB-ES) has developed this Generic Health and Safety Plan (HASP) to guide activities conducted under the Comprehensive Long-term Environmental Action Navy (CLEAN) Program in a safe and efficient manner. This document describes the training, monitoring, and work procedures that will be employed to ensure that the program is implemented as designed. The objectives of this Generic HASP are as follows:

- to provide a safe work environment,
- to minimize the risk of human and economic losses,
- to comply with all applicable safety and health laws and regulations,
- to ensure that project work activities are carried out in a safe, efficient manner and satisfy project goals.

1.2 ORGANIZATION. The individual chapters of this Generic HASP describe personnel responsibilities; training and medical monitoring requirements; protection and monitoring equipment; work practices; special requirements for work in confined spaces and excavations; decontamination procedures; and emergency planning requirements.

1.3 IMPLEMENTATION. Each project site is classified hazardous or non-hazardous after a review of available data. Prior to on-site activities at those sites classified as hazardous, a site-specific health-specific health and safety plan (Appendix A) must be completed by the project engineer or scientist. This is accomplished by a review of available information on the site to assess the potential risks and provide an initial determination of personal protection requirements. The HASP is subsequently reviewed and must be approved by the Health and Safety Supervisor (HSS) (see Chapter 2). The designated Site Health and Safety Officer (HSO) monitors actual site conditions and may alter these requirements as needed. In all cases, personnel safety is the paramount factor in decision-making.

CHAPTER 2. AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL

This section describes the health and safety personnel and their general responsibilities for the project.

2.1 HEALTH AND SAFETY MANAGER. The Health and Safety Manager (HSM) for ABB-ES can be reached by telephone at (207) 775-5401 in Portland, Maine. The HSM has final authority over health and safety issues that are not resolved at the site or through the Health and Safety Supervisor (HSS), and has overall responsibility for ensuring that the policies and procedures of this HASP are implemented by the Health and Safety Officer (HSO). In the various regions, the HSM may delegate additional functions to the Regional HSS.

2.2 HEALTH AND SAFETY SUPERVISOR. The HSS is the health and safety professional serving as the ABB-ES HSM's designee for this project. As such, the HSS will be responsible for (1) approval of the individual chosen to serve as the site HSO for this field operation; (2) review and approval of site-specific HASPs developed by the HSO, as well as any significant changes made over time to the site HASP; (3) oversight of the daily efforts of the HSO; (4) resolution of site disputes involving health and safety issues; and (5) implementation of the HASP by the HSO. The HSS will notify the HSM of any Stop Work Orders issued by an HSO.

2.3 HEALTH AND SAFETY OFFICER. The HSO is responsible for developing and implementing the site-specific HASP in accordance with the CLEAN Generic HASP. The HSO will conduct safety inspections and investigations of all accidents, illnesses, and incidents occurring on-site. The HSO will also conduct safety briefings and site-specific training for on-site personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting the site in response to health and safety issues. The HSO, in consultation with the HSS, is responsible for updating and modifying the site-specific HAS as site or environmental conditions change.

The HSO is vested with the authority to stop site operations by ABB-ES or subcontractor personnel (STOP WORK AUTHORITY) if he or she determines that an imminent health or safety hazard or other potentially dangerous situation exists. The HSO is to immediately notify the HSS of any Stop Work Orders issued. The HSO may also recommend to the HSS or HSM that the downrange authorization of individual site personnel be revoked for health or safety reasons.

The HSO, through the HSS, ensures that all personnel entering the site are qualified for downrange deployment, in accordance with the CLEAN HASP requirements.

CHAPTER 3. TRAINING PROGRAM

All personnel working on an ABB-ES site who potentially may be exposed to toxic substances or hazardous materials will participate in an initial training program on hazardous waste site operations and an annual refresher training or supervisory training (as appropriate), as well as site-specific training before commencement of the on-site assignment. The initial Health and Safety Training Program consists of the 40-hour training program required by the Occupational Safety and Health Administration (OSHA) in standard 29 Code of Federal Regulations (CFR) 1910.120. In addition to the initial training, ABB-ES uses 8-hour annual refresher and 8-hour supervisory training elements, which are augmented by site-specific training regarding site hazards and specialized problems and protocols.

3.1 INITIAL TRAINING. All site-assigned personnel who are potentially exposed to toxic substances or hazardous materials will be required to participate in a training course on hazardous waste site operations. This training is required under provisions of the OSHA standard, and must consist of 40 hours covering the following areas:

- familiarity with the regulations and implications of OSHA regulations in 29 CFR 1910.120;
- familiarity with the organizational structure responsible for site health and safety;
- explanation of the medical surveillance requirements, including recognition of health hazards;
- instruction in the use and maintenance of personal protective equipment;
- identification and analysis of site chemical and physical hazards;
- instruction regarding monitoring equipment, including personnel and environmental sampling instruments;
- instruction in site control and decontamination procedures;
- instruction in contingency planning; and
- instruction in confined-space entry procedures.

3.2 ANNUAL REFRESHER AND SUPERVISORY TRAINING. Annually, all personnel required to participate in the initial training will take an 8-hour refresher training course as required by 29 CRF 1910.120. Those personnel with either site supervisory or health and safety responsibilities will participate in an 8-hour supervisory training course. The 8-hour supervisory training meets requirements of the annual refresher.

3.3 SITE-SPECIFIC TRAINING. All personnel assigned to an ABB-ES site must participate in the site-specific training presentation, which will cover major elements of the site HASP, as well as health and safety procedures regarding an individual's specific job responsibilities and tasks. The site HSO or health and safety designee will provide this training before an individual is permitted to work in a downrange position.

3.4 OTHER TRAINING. Additional training will be provided as determined by the HSM or the HSS, and may include additional refreshers on personal protective equipment, instrumentation, cardiopulmonary resuscitation (CPR), first aid, or any other pertinent health- or safety-related subject.

CHAPTER 4. MEDICAL SURVEILLANCE PROGRAM

4.1 HEALTH MONITORING PROGRAM. All on-site ABB-ES personnel and laboratory staff must be enrolled in the Health Monitoring Program, which is implemented through Environmental Medicine Resources, Inc., a company consisting of a team of physicians and support personnel who specialize in occupational medicine. The health monitoring program consists of an initial medical examination to establish the employee's general health profile, which provides important baseline laboratory data for later comparative study and annual examinations. The contents of the initial comprehensive physical examination and laboratory testing routine are listed in Table 4-1. Follow-up examinations are completed annually for all personnel enrolled in the health monitoring program, or more frequently if project assignments warrant testing following specific field activities. Employees are certified fit for specific activities based on the results of the medical examination (see Figure 4-1).

4.2 REVIEW OF EXPOSURE SYMPTOMS. Symptoms of exposure to hazardous materials will be reviewed for each site to indicate to personnel the recognized signs of possible exposure to those materials. This information will be supplemented with a discussion of the need for objectivity in the personal health assessment to account for normal reaction to stressful situations. The HSO will watch for outward evidence of changes in worker health. Symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold, or loss of appetite. Employees will routinely be asked to assess their general state of health during the project. Special medical monitoring may be identified for certain sites. All on-site personnel are required to review and sign the site-specific health and safety plan describing site-specific hazards and assoicated risks (see Appendix A, Section 8.3).

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code (___) _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code (___) _____

Do you wear contact lenses? Yes ( ) No ( )

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

_____

Name of Personal Physician: _____

Telephone: Area Code (___) _____

TABLE 4-1
BASELINE HEALTH MONITORING PROGRAM

PHYSICAL EXAMINATION

- medical history
- medical examination
- vision:
  - near/distant
  - color
- audiometry
- radiology: PA/LAT
- spirometry
- electrocardiogram

LABORATORY ANALYSIS

Complete Blood Counts and Chemistries

- white blood count
- differential cell counts
- methemoglobin
- uric acid
- lactic dehydrogenase
- alkaline phosphatase
- calcium
- phosphorus
- cholesterol
- urea nitrogen
- glucose
- albumin
- globulin
- total protein
- total bilirubin
- serum glutamic oxalacetic transaminase
- hemoglobin and/or hematocrit

Urine Analysis

- color and character
- specific gravity
- pH
- protein
- acetone
- glucose
- microscopic examination

Medical Summary
Environmental Medicine Resources, Inc.
4360 Chamblee Dunwoody Road
Atlanta, GA 30241

Ms. Cindy Sundquist
ABB Environmental Services, Inc.
261 Commercial Street
P. O. Box 7050
Portland, ME 04112

Employee:
SSN#:
Exam Date:

Re-evaluation of Toxin Exposure 06.A
Report Date:

The individual identified above has completed a medical surveillance examination. Review of the data from this examination resulted in the following conclusions:

MEDICAL AND SAFETY RESTRICTIONS/RECOMMENDATIONS

None

APPRAISAL OF LIFTING CAPACITY

Lifting Capacity for this individual appears to be II/II
(I=up to 25 lbs., II=up to 60 lbs., III-up to 100 lbs. frequently)

CLEARANCE FOR WORK WITH HAZARDOUS MATERIALS

In compliance with 29 CFR 1910.120 (f), medical clearance is issued for individual to work with hazardous materials.

USE OF RESPIRATORY EQUIPMENT

In compliance with 29 CFR 1910.134, medical clearance is issued for unrestricted use of respiratory equipment.

EXPOSURE TO TEMPERATURE EXTREMES

Exposures to temperature extremes are acceptable providing that reasonable precautions are taken.

PUBLIC LAW 100-690

Not a requirement of this examination.

DEPARTMENT OF TRANSPORTATION CERTIFICATION

Not requested.

The employee has been informed of the results of this medical examination and also advised of any specific health implications of their employment to the extent required by existing law.

David L. Barnes, M.D., FACS, FACPM
V.P. Medical Affairs/Medical Director

FIGURE 4-1
PHYSICIAN CERTIFICATION

CHAPTER 5. ENGINEERING CONTROLS

Whenever feasible, engineering controls will be used at the site to reduce employee exposure to hazardous substances. Feasible engineering controls may include the following:

- the use of pressurized cabs or control booths,
- the use of remotely operated materials-handling equipment, and
- the use of industrial-sized fans to blow hazardous vapors from the breathing zone when exposure is from a point source and a power source is available.

CHAPTER 6. PERSONAL PROTECTIVE EQUIPMENT

6.1 PERSONAL PROTECTION LEVEL DETERMINATION. The level of personal protective equipment required will be determined by the type and levels of waste or spill material present at the site where project personnel may be exposed. In situations where the types of waste or spill material on-site are unknown, the hazards are not clearly established, or the situation changes during on-site activities, the HSO must make a reasonable determination of the level of protection that will ensure the safety of investigators and response personnel until potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses, or other reliable methods. Once the hazards have been determined, protective levels commensurate with the hazards will be used. Protection requirements will be evaluated on a continuous basis to reflect new information as it is acquired.

6.2 LEVELS OF PROTECTION. The following subsections describe the basic composition of the generally recognized protective ensembles to be used for site operations. Specific components for any level of protection will be selected based on hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves, and other equipment, exclusive of respirators, should be used when feasible to minimize risks during decontamination and possible cross-contamination during sample handling.

6.2.1 Level A Level A protection provides the highest level of protection for skin, eyes, and the respiratory system. It is appropriate for conditions where there are potential or actual high concentrations of atmospheric vapors, gases, or particulates. Level A should be used if site operations or work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to the skin or capable of being absorbed through the intact skin. Level A is used primarily for emergency situations or when the following conditions exist: (1) vapors or mists of strong acids; (2) known or probable immediately dangerous to life and health (IDLH) atmospheres with dermally active compounds; (3) high atmospheric concentrations of compounds that can be absorbed through the skin; and (4) operations that must be conducted in a confined, poorly ventilated area, where conditions requiring Level A have not yet been eliminated. The fully encapsulating suit and the pressure-demand self-contained breathing apparatus (SCBA) or hoseline respirator are the key elements in Level A personal protective equipment (PPE).

Level A equipment includes the following items:

- SCBA (pressure demand) or supplied air respirator (pressure demand with escape mask);
- total encapsulating suit;
- coveralls (optional);
- gloves (outer, chemical-resistant);

- gloves (inner, chemical-resistant);
- boots (chemical-resistant, steel-toed, steel shank);
- hardhat (optional);
- disposable protective suit, gloves, and boots (to be worn over or under encapsulating suit); and
- two-way radios.

6.2.2 Level B Level B protection should be used when the type and atmospheric concentration of substances have been identified and require a high level of respiratory protection; however, the atmospheric contaminant, splashing liquid, or other direct contact will not adversely affect or be absorbed through any exposed skin. This includes atmospheres with IDLH concentrations of specific substances that do not (1) represent a severe skin hazard, or (2) meet the criteria for use of air-purifying respirators. Level B has the same respiratory protection criteria as Level A; however, the danger of dermal exposure is not as severe.

Level B equipment includes the following items:

- SCBA (pressure demand) or supplied air respirator (pressure demand with escape SCBA),
- hooded chemical-resistant clothing (coated Tyvek)™,
- coveralls (optional),
- gloves (outer, chemical-resistant),
- gloves (inner, chemical-resistant),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- hardhat (optional),
- two-way radio (optional, to be worn outside protective clothing), and
- face shield (optional).

Wrist and ankle openings should be sealed with duct tape.

6.2.3 Level C Level C protection should be used when the atmospheric contaminant, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin. In addition, the types of air contaminants must have been identified, the concentration measured, and an air-purifying res-

pirator must be available that can remove the contaminants. An air-purifying respirator can only be used if the oxygen content in the air is at least 19.5 percent, the contaminant has adequate warning properties (e.g., odor, taste, and irritating effect thresholds within two times the Threshold Limit Value), the concentration of the contaminant does not exceed the IDLH, and the worker's respirator has been fit-tested. Level C has the same splash protection as Level B; however, cartridge respirators are used instead of SCBAs.

Level C equipment includes the following items:

- full-face respirator (cartridge),
- hooded chemical-resistant clothing (coated Tyvek),
- coveralls (optional),
- gloves (inner, chemical-resistant),
- gloves (outer, chemical-resistant),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- hardhat (optional),
- escape mask (optional),
- two-way radios (optional, worn outside protective clothing), and
- face shield (optional).

Wrist and ankle openings should be sealed with duct tape.

6.2.4 Level D Level D is a work uniform affording minimal protection and is used for nuisance contaminants only. Level D protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Level D equipment includes the following items:

- coveralls,
- gloves (optional),
- boots (chemical-resistant, steel-toed, steel shank),
- boot covers (chemical-resistant) (optional),
- safety glasses or chemical splash goggles (optional),
- hardhat (optional),
- escape mask (optional), and
- face shield (optional).

CHAPTER 7. MONITORING EQUIPMENT

The work environment will be monitored to ensure that IDLH or other dangerous conditions are identified. At a minimum, monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

7.1 AIR SAMPLING: EQUIPMENT, CALIBRATION, AND MAINTENANCE. To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct-reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading levels of protection, at the discretion of the site HSO.

7.1.1 ISD Dual Detector This meter monitors for combustible gases and oxygen. It can be used to determine (1) if an area contains concentrations of combustible gases with readings as a percentage of the lower explosive limit (LEL); and (2) the percentage of oxygen. This equipment will be calibrated in accordance with the manufacturer's instructions.

7.1.2 NMS MX-241 (Explosimeter) This instrument is calibrated to detect methane and monitors combustible gases as a percentage of the lower explosive limit. It will be calibrated in accordance with the manufacturer's instructions.

7.1.3 ISD HS267 This instrument monitors for the presence of hydrogen sulfide in parts per million (ppm). It will be calibrated in accordance with the manufacturer's instructions.

7.1.4 Photovac™ Organic Vapor Analyzer 10S50 The Photovac™ Organic Vapor Analyzer (OVA) is a total organic vapor analyzer capable of detecting volatile organic compounds (VOC) that can be ionized by ultraviolet (UV) light. Model 10S50 is commonly used on-site to estimate the presence of VOCs for purposes of crew protection, well screen placement, and selection of samples for further analysis. The principle of operation is twofold: (1) the ambient temperature gas chromatograph, which breaks down mixtures of VOC into individual components identified by retention time; and (2) detection accomplished by ionization in UV light. The charged component then moves to an electrode which, in turn, results in a meter deflection proportional to the concentration of the contaminant. This instrument does not read out directly in ppm unless calibrated against the material being measured; therefore, results must be interpreted conservatively and with care. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

7.1.5 HNU IS101 and Photovac TIP Photoionization Detector Like the OVA, the photoionization detector (PID) operates on the basis of ionization of the contaminant, which results in a meter deflection proportional to the concentration of the contaminant. In the PID, ionization is caused by a UV light source. The strength of the UV, measured in electron volts (eV), determines which contaminants can be ionized. The HNU can use three different-strength UV sources, including 9.6, 10.2, and 11.7 eV; only the 10.2- and 11.7-eV probes are

currently available for field use. The TIP operates using a UV light source of 10.6 eV. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

7.1.6 Detector Tubes (MSA and Draeger™) A colorimetric detector tube is a direct-reading instrument consisting of a glass tube impregnated with an indicating chemical, which is connected to a piston cylinder or bellows-type pump. A known volume of air is drawn through the glass tube. The contaminant in the air reacts with the indicator chemical, producing a stain the length of which is proportional to the contaminant's concentration. Care must be taken when using the detector tubes because reliability of the results depends on the proper pump calibration, the degree of stability of the reacting chemical, and the ambient temperature. Interfering gases or vapors can also positively or negatively affect measured results. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

7.2 PERSONAL MONITORING: EQUIPMENT, CALIBRATION, AND MAINTENANCE. Personal monitoring will be undertaken to characterize exposure of high-risk employees to hazardous substances encountered on-site.

7.2.1 Personal Sampling Pumps These devices can be worn by an employee to draw air samples through appropriate collection media. The units can be used to draw volumes from 2 to 3 liters per minute. Calibration will be conducted using standard industrial hygiene protocols before and after each sampling session (i.e., each day's use).

7.2.2 Passive Dosimeters or Gas Badges These devices are nonmechanical collection devices used to monitor for organic vapors and various gases. The device is worn by an employee and then sent to an industrial hygiene laboratory for analysis.

7.2.3 Thermoluminescent Dosimetry Body Badges These devices are nonmechanical collection devices used to monitor for x-ray, beta, and gamma radiation exposure. The badges are worn by ABB-ES employees and sent quarterly to Tech/Ops Landauer, Inc., for analysis.

CHAPTER 8. ZONATION

The site itself will normally be divided into three zones: (1) the majority of the work area, considered the Exclusion Zone; (2) limited areas serving as the Support Zone; and (3) an area for decontamination called the Contamination Reduction Zone (CRZ).

8.1 EXCLUSION ZONE. The Exclusion Zone isolates the area of contaminant generation and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and off-site locations. The Exclusion Zone is demarcated by the Hot Line (i.e., a tape line or physical barrier). Personnel entering the Exclusion Zone must (1) enter through the CRZ; (2) wear the prescribed level of protection; and (3) be otherwise authorized to enter the Exclusion Zone. Any personnel, equipment, or materials exiting the Exclusion Zone will be considered contaminated. Personnel will be subject to decontamination; equipment and materials will either be subject to decontamination or containerized in uncontaminated devices.

Within the Exclusion Zone, specific locations or restricted areas (clearly marked or identified) will be established (as necessary) for particular locations or around specific site operations. In the case of well drilling or excavation operations, a restricted area will be established that includes a minimum 30-foot radius from the drill rig or excavation operation. Other restricted areas may include drum areas, active site areas, sources of combustible gases or air contaminants, or other dangerous areas as they are identified. Access for emergency services to areas of specific site operations will be established.

8.2 CONTAMINATION REDUCTION ZONE. Moving out from the Exclusion Zone, starting at the Hot Line and continuing to the Contamination Control Line, is the CRZ. The CRZ is a transition zone between contaminated and uncontaminated areas of the site. When "hot" or contaminated personnel, equipment, or materials cross the Hot Line, they are assumed to be as hot or contaminated as they are going to be from site operations. Being subjected to the decontamination process, they become less contaminated; when they reach the Contamination Control Line, they are clean and can exit the CRZ without spreading contamination.

Within the CRZ is the Contamination Reduction Corridor, where materials necessary for full personnel and portable equipment decontamination are kept. A separate facility will be established for heavy equipment decontamination. In addition, certain safety equipment (e.g., emergency eye wash, fire extinguisher, stretcher, and first aid kit) are staged in this zone.

8.3 SUPPORT ZONE. The Support Zone is the outermost zone of the site, separated from the CRZ by the Contamination Control Line; it is considered a clean area. Movement of personnel and materials from the Support Zone into the CRZ is generally unrestricted, except as required through access points controlled for administrative purposes. However, only uncontaminated or decontaminated personnel or materials may enter the Support Zone from the CRZ.

The Support Zone contains the necessary support facilities (including personal hygiene facilities) for site operations. It also serves as the communications center and source of emergency assistance for operations in the Exclusion Zone and CRZ. A log of all persons entering the site will be maintained by the HSO, the field operations leader, or the site designee.

CHAPTER 9. WORK PRACTICES

9.1 GENERAL. Workers will be expected to adhere to the established safe work practices for their respective specialties (e.g., drilling, laboratory analysis, and construction). The need to exercise caution in the performance of specific work tasks is made more acute due to (1) weather conditions; (2) restricted mobility and reduced peripheral vision caused by the protective gear itself; (3) the need to maintain integrity of the protective gear; and (4) the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are the following.

- In any unknown situation, always assume the worst conditions and plan responses accordingly.

- Use the buddy system. Under no conditions will any person be permitted to enter the Exclusion Zone alone. Establish and maintain communications. In addition to radio communications, it is advisable to develop a set of hand signals, because conditions may greatly impair verbal communications.

- Because no personal protective equipment is 100 percent effective, all personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment on drums or the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground in the Exclusion Zone or CRZ. Avoid standing in or walking through puddles or stained soil.

- Disposable items will be used, when possible, to minimize risks during decontamination and possible cross-contamination during sample-handling.

- Smoking, eating, or drinking in the work area and before decontamination will not be allowed. Oral ingestion of contaminants is a likely means of introducing toxic substances into the body.

- Avoid heat and other work stresses related to wearing protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.

- Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.

- Conflicting situations that may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the HSO to avoid any motivation or pressure to circumvent established safety policy.

- To the extent feasible, handling of contaminated materials should be done in a remote area, particularly when drummed or other containerized hazardous waste materials are found on-site. Every effort should be made to

identify the contents of containers found on-site before they are subject to material-handling applications.

- Personnel must be observant of not only their own immediate surroundings but also that of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while using personnel protective gear because vision, hearing, and communication can be restricted.

- Contact lenses are not allowed to be worn on-site; if corrosive or lachrymose substances enter the eyes, proper flushing is impeded.

- All facial hair that interferes with the face piece fit must be removed before donning a respirator at all sites requiring Level C or Level B protection.

- Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.

- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working while ill during field investigation assignments.

- The site leader, HSO, and sampling personnel will maintain project records in a bound notebook (e.g., daily activities, meetings, incidents, and data). Notebooks will remain on-site for the project duration so that replacement personnel may add information, thereby maintaining continuity. The notebooks and daily records will become part of the permanent project file.

- Appropriate provisions of the U.S. Army Corps of Engineers "Safety and Health Requirements Manual" (EM385-1-1) will be followed.

9.2 SITE ENTRY PROCEDURES. In most cases, ABB-ES teams are not the first on-site investigators. Considerable knowledge of site history and current status allows preparation of a HASP with reasonable assurance that personnel are adequately protected. In the event that sufficient site information is not available to perform a summary risk assessment and assign the appropriate level of personal protective equipment, the following procedures should be followed. It must be understood that verification of the level of contamination (even with background information) will always require some of the following steps.

1. Recognize that ABB-ES's presence on-site implies a perceived contamination potential by the client.

2. Assume that the site is contaminated and conduct a site safety reconnaissance, consisting of the following activities:

    - establish a CRZ (decontamination area),

- survey the site at the highest level of protection practicable, beginning with a perimeter survey and gradually covering all areas of proposed activity with the following (as appropriate):

    - HNU PID
    - OVA
    - radiation survey meter
    - personal air sampling pumps
    - chemically reactive indicator tubes
    - oxygen-deficiency meter
    - explosive mixture meter,

- Establish a "hot zone,"

- Review data, assess risk, and select the appropriate level of protection.

3. Prepare a summary site HASP and document all data acquired.

CHAPTER 10. CONFINED-SPACE ENTRY PROCEDURES

10.1 CONFINED SPACE CLASSIFICATION. Confined spaces are classified according to existing or potential chemical and physical hazards. Classification is based on characteristics of the confined space, oxygen level, flammability, and toxicity. Table 10-1 defines the parameters of each classification. If any hazard presents a situation that is IDLH, the confined space is classified as Class A. Classification is determined by the most hazardous condition of entering, working in, and exiting a confined space. Class B confined spaces have the potential for causing injury and illness but are not IDLH. Class C entry is one in which the chemical hazard potential is minimal and does not require any special modification in work procedures.

10.2 ENTRY PROCEDURES

10.2.1 Team Size A minimum of three workers is required for each confined space activity; that is, two entry and one standby, or one entry, one rescue, and one standby. If the former arrangement is used, all three workers must be ABB-ES employees. If the latter arrangement is used, the standby could be a non-ABB-ES team member, assuming he or she has comparable training, is proficient in the assigned duties, and is capable of using all safety equipment.

The one entry, one rescue, one standby arrangement should only be used when the confined space is relatively small or the entry person will be in the line of sight at all times. In this instance, the rescue person acts as the second person in the "buddy system."

The two entry, one standby arrangement is used when the area of the confined space is larger, and the tasks may take the worker away from the entryway. Again, care must be taken using this arrangement because the standby person cannot enter the confined space and attempt rescue unless adequately protected (i.e., respiratory and dermal) and replaced by another qualified standby person.

Three workers is the minimum number required for these activities and, in most cases, should only be used for relatively nonhazardous confined spaces. Additional crew may be needed if entering a Class A or Class B confined space, including rescue, decontamination, and line-of-sight personnel.

10.2.2 General Entry Procedures The following steps must be taken when entering a confined space.

1. Inspect all pieces of equipment to ensure they are in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.

2. Conduct a background check to identify all potential hazards that may be encountered in the confined space. Determine whether there is potential for fire or explosion hazards, as well as a toxic or oxygen-deficient atmosphere.

CONFINED SPACE CLASSIFICATION TABLE

PARAMETERS	CLASS A (LEVEL A OR B PPE)	CLASS B (LEVEL B OR C PPE)	CLASS C (LEVEL D PPE)
Characteristics	Immediately dangerous to life: Rescue procedures require the entry of more than one individual fully equipped with life-support equipment; maintenance of communication requires an additional standby person stationed within the confined space.	Dangerous, but not immediately life-threatening: Rescue procedures require the entry of no more than one individual fully equipped with life-support equipment; indirect visual or auditory communication with workers.	Potential hazard requires no modification of work procedures: Standard rescue procedures, direct communication with workers from outside the confined space.
Oxygen	19.4 percent or less *(122-mm Hg) or greater than 25 percent *(190 mm Hg)	19.5 to 21.4 percent *(122- to 147-mm Hg) or 21.5 to 25 percent (163- to 190-mm Hg)	19.5 to 21.4 percent *(148- to 163-mm Hg)
Flammability Characteristics	20-percent or greater LEL	10- to 19-percent LEL	10-percent LEL or less
Toxicity	**IDLH	Between the TLV/PEL and the **IDLH. If air-purifying respirators are used, maximum level based on breakthrough time (1,000 ppm maximum).	Less than the TLV/PEL
Respiratory Protection	SCBA or supplied air respirator with escape bottle.	SCBA, supplied air respirator with escape bottle or air-purifying respirator.	None.

* Based on total atmospheric pressure of 760-mm Hg (sea level).

** Immediately Dangerous to Life or Health, as referenced in NIOSH Registry of Toxic and Chemical Substances, Manufacturing Chemists data sheets, industrial hygiene guides, or other recognized authorities.

NOTES: Hg = mercury; LEL = Lower Explosive Limit; PEL = Permissible Exposure Limit; SCBA = Self Contained Breathing Apparatus; TLV = Threshold Limit Value PPE = Personal Protective Equipment

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3. Before entry, the atmosphere inside the confined space must be tested. An attempt should be made to test the atmosphere without opening the entryway (i.e., through a vent line or a small opening). If the entryway must be opened to test and only low levels are expected in the confined space, crack open the entryway, test the breathing zone first, and then test the confined space. If potentially high levels are expected in the breathing zone, respiratory protection should be worn before opening the entryway cover.

4. If an explosive, toxic, or oxygen-deficient atmosphere is detected, purge or ventilate the confined space prior to entry. Retest the atmosphere three times at 5-minute intervals. A person can enter the confined space without respiratory protection only if all three test results are below the Permissible Exposure Limit/Threshold Limit Value (PEL/TLV), 10 percent of the LEL, and above 19.5-percent oxygen (all three conditions must be met). (NOTE: Any downward deflection of the readings on the oxygen meter from background [i.e., 20.9 percent] should be viewed as potential for an IDLH atmosphere. Unless contaminants are known to be nontoxic, do not enter the confined space without respiratory protection if the oxygen level is below background.)

5. Install a blank or a block, or otherwise isolate, lockout, and tag all chemical, physical, and/or electrical hazards wherever possible.

6. If using an air-purifying respirator or if an IDLH and/or explosive atmosphere exists, air monitoring must be on a continuous basis. If respiratory protection is not used and there is potential for atmospheric conditions to change due to work practices or conditions, air monitoring should be done periodically. In all these cases, a 5-minute escape pack must be used.

7. Record all results of the tests for hazardous conditions including the location, time, date, and weather (if applicable); and readings on the PID, combustible gas meter, oxygen-deficiency meter, Draeger tubes, and any other equipment used on the Confined-Space Entry Checklist-General Entry form (Figure 10-1) and the Confined-Space Entry Checklist (Figure 10-2). Send a copy of the completed form to the HSM or the HSS.

8. Wear appropriate clothing for site conditions, as determined by the HSO.

   A safety belt or harness with lifeline must be worn if hazardous conditions exist, although good safety precautions dictate their use regardless of "existing" conditions. If the diameter of the entryway is less than 18 inches, the wrist-type harness must be used and special provisions made if a supplied-air respirator is necessary.

9. One person (i.e., standby) must remain at the entryway at all times and must keep continuous contact with the person entering the confined space. Contact can be maintained by line of sight, listening for sounds, the safety line, and/or radio. The standby person must not enter the confined space unless another trained person is available to act as standby, and he

CONFINED SPACE ENTRY CHECKLIST
GENERAL ENTRY

Site Name: _____ Entry Date: _____

Site Location: _____

Type of Confined Space: _____ Weather: (if applicable) _____

Work to be Performed: _____

Level of Personal Protection: _____

Potential Hazards: (Check all that apply)

☐ Corrosive	☐ Reactive	☐ Radioactive	☐ Hot Equipment
☐ Ignitable	☐ Volatiles	☐ Noise	☐ Falling Objects
☐ Toxic	☐ Biological	☐ Sharp Objects	☐ Pressure Systems
☐ Other: (list) _____			

Yes	No	N/A	
☐	☐	☐	Will work performed produce additional hazards (e.g. cleaning)? List: _____
☐	☐	☐	Were instruments calibrated prior to entry?
☐	☐	☐	Was confined space ventilated prior to entry?
☐	☐	☐	Will ventilation continue during entry?
☐	☐	☐	Is air intake of the ventilation system located in an area free of exhaust and combustible/toxic substances?
☐	☐	☐	Has space been isolated from other systems?
☐	☐	☐	Has mechanical equipment been locked-out or disconnected?
☐	☐	☐	Has mechanical equipment been blocked, chocked, disengaged, and/or disconnected where necessary?
☐	☐	☐	Are safety lines and harnesses used?
☐	☐	☐	Will wrist-type harnesses be used if entryway is less than 18 in.?
☐	☐	☐	Are nonsparking tools and intrinsically safe/explosion-proof powered tools and lighting used?

Entry Person(s): _____

Standby Person: _____ Rescue Person: _____

Other: _____

HSO: _____

FIGURE 10-1

CONFINED SPACE ENTRY CHECKLIST WORKSHEET

INITIAL ATMOSPHERE TESTING RESULTS: Record time and results of initial testing. If ventilation is necessary, record readings when the atmosphere stabilized and at 5-minute intervals.

	Breathing Zone	Initial	Atmosphere Stabilized	@ 5 min.	@ 10 min.
Time					
Combustible Gas Meter (%LEL)					
Oxygen Meter (%Oxygen)					
Hydrogen Sulfide Meter (ppm)					
PID Meter (ppm)					
Draeger Tube (ppm) Tube:					
Other List:					

ENTRY ATMOSPHERE TESTING RESULTS: Record time and the results of monitoring at initial entry and at 10-minute intervals. If no change in levels, extend to every 15 minutes. If significant fluctuations occur, reduce to every 5 minutes. (Note: Meters should be operated continuously in the confined space.)

	Initial				Final
Time					
Combustible Gas Meter (%LEL)					
Oxygen Meter (%Oxygen)					
Hydrogen Sulfide Meter (ppm)					
PID Meter (ppm)					
Draeger Tube (ppm) Tube:					
Other List:					

FIGURE 10-2

or she is equipped with adequate respiratory and dermal protection. (In most cases, respiratory protection would be an airline respirator or SCBA.)

10. Do not smoke when working in or near confined spaces and do not take flash-lit photographs when explosive gases are known or suspected to be present.

11. Do not rely on permanent ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect permanent ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use either a portable ladder of adequate height to reach 3 feet above opening or a rope ladder, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off, if possible; otherwise, it should be held in place by the standby person.

12. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps if combustible atmospheres are possible.

13. The entry person must not remain in the confined space if he or she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Many of the gases that cause the most problems are odorless, tasteless, and invisible.

10.2.3 Manhole/Sewer Entry When preparing to enter a manhole/sewer, the following safety measures must be taken.

1. Inspect all pieces of equipment to ensure they are in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.

2. Park the vehicle near the manhole (DO NOT leave the vehicle running). If the manhole is in the street, it is best to park so as to detour oncoming traffic around the manhole. The vehicle's emergency flashers and portable yellow warning beacon must be ON. The vehicle serves as protection from oncoming traffic, can be used to store emergency equipment (e.g., SCBA and first aid kit), and can be used in an extreme emergency to slowly pull an injured person from the confined space if a tripod with hoist attachment is unavailable or inoperative.

3. Erect portable barricades or cones around the manhole and in front of the vehicle to see that traffic is adequately diverted and to prevent pedestrians from falling in. Reflective vests should be worn so that workers are visible to approaching traffic.

4. If there are openings large enough to admit sampling tubes, test for the presence of explosive and toxic gases before removing each manhole cover. Otherwise, raise one side of the cover using the cover hook or pick, prop it slightly open, and conduct the tests.

5. If toxic or explosive gases are detected in the sewer, report this immediately to the local fire department and/or department of public works.

6. Using the Manhole/Sewer Entry Log Form, record the results of tests for hazardous conditions, including location, manhole number (if applicable), time, date, weather (if applicable), and readings on the PID, combustible gas meter, oxygen-deficiency meter, and Draeger tube (Figure 10-3). Send a completed copy of the form to the HSS.

7. Remove manhole covers with a cover hook or pick; do not improvise. Be careful of fingers and toes; the cover is usually heavy and difficult to handle. Unless the cover is extremely heavy, it is safer for only one worker to handle it.

8. Test the atmosphere; if a toxic, flammable, or oxygen-deficient atmosphere exists, ventilate the sewer. Depending on the hazard, ventilation can be accomplished in various ways, for example: (1) remove and vent the adjoining upstream and downstream manhole covers, as soon as possible and well in advance of entering the manhole (high hazard); and (2) vent the manhole in which entry will occur (very low hazard). If a blower is used, it is desirable to establish a flow of air in the sewer, <u>in</u> one manhole and <u>out</u> another. Ensure that the air intake is well away from automobile exhaust, and combustible and/or toxic atmospheres. Appropriate traffic control measures must be taken by barricading or otherwise marking the open manholes.

9. After ventilating, test for explosive and toxic gases and oxygen deficiency in the manhole at ground level and at the bottom; record the results. If entering the sewer itself, make the same tests at the manholes at either end. If ventilation is necessary, monitor the atmosphere in the manhole while work progresses, or continue operation of the blower. Continuous monitoring (i.e., equipment ON during entire entry) is imperative because conditions within the sewer may change rapidly. Do not enter a manhole while there is an oxygen deficiency without a pressure-demand, air-supplied breathing apparatus. If the oxygen level is below background, i.e., less than 20.9 percent, caution must be taken because an IDLH atmosphere may exist.

10. When entering manholes or tanks, wear hardhats, protective clothing, and unless inappropriate, respiratory protection and safety belt or harness with lifeline. If the manhole is less than 18 inches in diameter, a wrist-type harness must be used and special provisions made if air-supplied respirators are necessary. When working in manholes greater than 12 feet deep, in the sewer itself, or where potential exists for gases to appear unexpectedly, a 5-minute emergency egress air supply is required (unless the time required to don the emergency respirator is greater than what would be needed to exit the manhole).

11. At least one person (i.e., standby) must remain at the manhole at all times and must keep continuous contact with the person entering the sewer. Contact can be maintained by line of sight, listening for sounds, and the

MANHOLE/SEWER ENTRY LOG

Location:_____ Date:_____

Crew Chief:_____ Others:_____

HSO:_____ _____

Two-way radio available and working?_____

Traffic control equipment in place?_____

Location of nearby emergency telephone:_____

Level of personal protective equipment to use:_____

Safety harness with lifeline used?_____

Monitoring equipment calibrated prior to use?_____

INITIAL ATMOSPHERE TESTING RESULTS

	Time	Hydrogen Sulfide	PID	Oxygen	LEL	Other
Manhole Opened						
Begin Ventilation						
Atmos. Stabilized						
@ 5 minutes						
@ 10 minutes						

ENTRY ATMOSPHERE TESTING RESULTS

	Time	Hydrogen Sulfide	PID	Oxygen	LEL	Other
Entry						
@ 10 minutes*						
@ 20 minutes*						
@ 30 minutes*						

* More often if needed

FIGURE 10-3

safety line and/or radio. The standby person must not enter the manhole unless another trained person is available to act as standby and has adequate respiratory and dermal protection available. (In most cases, respiratory protection will be an airline respirator or SCBA.) The standby/rescue person should be suited up (but not yet on air) before the work crew enters the confined space.

12. Do not smoke when working in or near manholes. Do not take flash-lit photographs when explosive gases are known or suspected to be present.

13. Do not rely on the manhole ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect manhole ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use a portable ladder of adequate height to reach 3 feet above the manhole opening, a rope ladder, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off if possible; otherwise, it should be held in place by the standby person.

14. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps in the manhole or sewer.

15. The entry person must not remain in the manhole or sewer if he or she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Remember that carbon monoxide, carbon dioxide, methane, and hydrogen sulfide, which cause the most trouble, are odorless (hydrogen sulfide has a distinct odor only during initial exposure), tasteless, and invisible.

CHAPTER 11.0 EXCAVATION AND TRENCHING

11.1 EXCAVATION PROCEDURES. Because excavations and trenches pose a hazard to employees, structures, and equipment, all excavations created during site operations will be done in accordance with 29 CFR 1926 Subpart P. The following steps summarize the excavation procedures that will be followed by all ABB-ES personnel.

- Prior to excavating or trenching, all surface encumbrances located so as to create a hazard to the employees will be removed or supported, and all underground utilities will be determined and located.

- Entry into excavations will be avoided whenever possible. If entry is unavoidable, the excavation will be considered a confined space; as such, entry will be done in accordance with the Confined Space Entry Program (see Chapter 10.0).

- Under no circumstances will site personnel enter excavations that are not adequately protected from cave-ins by shoring or sloping.

- Stairways, ladders, or ramps will be located in trenches deeper than 4 feet and situated to require no more than 25 feet of lateral travel.

- Excavations below the base of a building or structure will not be permitted unless the building or structure is adequately supported or a registered professional engineer determines that the excavation will not pose a hazard to the employee.

- All equipment will be kept at least 2 feet from the edge of the excavation.

- Any excavation left open and unattended will be barricaded or covered until it can be backfilled.

11.2 SLOPING. Acceptable options for sloping or benching include the following:

Option 1. a slope of 1½ horizontal to 1 vertical (34 degrees measured from the horizontal);

Option 2. determination of the maximum allowable slope based on soil conditions and in accordance with the conditions and requirements set forth in 29 CFR 1926 Subpart P, Appendices A and B;

Option 3. designs of sloping or benching systems using tabulated data approved by a registered professional engineer; and

Option 4. other systems designed by a registered professional engineer;

11.3 SHORING. Acceptable options for shoring include the following:

Option 1. designs using Appendices A, C, and D of 1910.126 Subpart P;

Option 2. designs using manufacturers tabulated data;

Option 3. designs using tabulated data approved by a registered professional engineer, and

Option 4. other support systems designed by a registered professional engineer.

CHAPTER 12. TEMPERATURE EXTREMES

12.1 HEAT STRESS. Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there is increased potential for injury, specifically heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

12.1.1 Identification and Treatment

12.1.1.1 Heat Exhaustion.

Symptoms. Heat exhaustion usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, the skin is clammy, and he or she may perspire profusely. The pulse is weak and fast; breathing is shallow. The victim may faint unless he or she lies down. This may pass; however, sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.

First Aid. Immediately remove the victim to the CRZ in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock (i.e., have the victim lie down, raise the feet 6 to 12 inches, and maintain body temperature but loosen all clothing). If the victim is conscious, it may be helpful to give sips of water. Transport the victim to a medical facility.

12.1.1.2 Heat Stroke.

Symptoms. This is the most serious of heat casualties because the body excessively overheats. Body temperatures often are between 107 and 110° F. The victim will have a red face and may not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.

First Aid. Immediately evacuate the victim to a cool and shady area in the CRZ. Remove all protective outer wear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels or ice bags to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling. Do not give stimulants. Transport the victim to a medical facility as soon as possible.

12.1.2 Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids and salts through sweating. Fluids should be maintained in the Support Zone. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods,

or commercial mixes such as Gatorade™. The commercial mixes are advised for personnel on low-sodium diets.

During warm weather, a work schedule will be established that allows most work to be conducted during the morning hours, before ambient air temperature levels reach highs.

A work rest schedule will be implemented for personnel required to wear Level B or C protection (i.e., an impervious outer garment) with sufficient time allowed for personnel to "cool down" (this may require working in shifts). Two hours is the maximum time between breaks at Level B or C, regardless of temperature. At elevated temperatures, breaks should be scheduled as follows:

Ambient Temperatures	Maximum Time Between Cool Down Breaks
Above 90 °F	¼ hour
85 to 90 °F	½ hour
80 to 85 °F	1 hour
70 to 80 °F	1½ hours

12.1.3 Heat Stress Monitoring Monitoring of personnel wearing impervious clothing should commence when the ambient temperature reaches 70 °F, with increased frequency if ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85 °F, workers should be monitored for heat stress after every work period. As a screening mechanism of the body's recuperative ability to excess heat, one or more of the following techniques should be used.

1. Measure the heart rate (HR) for 30 seconds, by radial pulse, as early in the resting period as possible. At the beginning of the rest period, the HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the pulse rate is still above 110 beats per minute at the beginning of the next rest period, the following work cycle should again be shortened by 33 percent.

2. Measure oral body temperature with a clinical thermometer, as early as possible in the resting period. At the beginning of the rest period, oral temperature (OT) should not exceed 99 °F. If OT exceeds 99 °F, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the OT again exceeds 99 °F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should also be measured at the end of the rest period to ensure that it has dropped below 99 °F.

3. Maintain good hygienic standards by changing clothes frequently, showering daily, and allowing clothing to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

12.2 COLD STRESS. Cold weather may often cause problems for personnel working outside, even at temperatures above freezing. As temperatures drop below freezing, the potential for cold weather injuries increases dramatically, as does the potential for equipment failure. Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0 °F (-18 °C) or if the windchill factor drops below -29 °F (-34 °C). These levels represent guidelines that should be used as an action level unless the HSO determines and documents otherwise. Table 12-1, which shows equivalent temperatures (i.e., windchill) for a range of ambient conditions, should also be referred to.

Snow and ice increase the risks to personnel and operations through reduced visibility, increased potential for falling injuries, reduced on-site mobility, and the increased time required to access the site (or off-site support services).

In view of these factors, it is critical that the HSO establish site-specific safety and operating protocols, and that all on-site personnel be made aware of the risks.

12.2.1 Local Cold Injuries Local cold injuries affect specific areas of the body (e.g., fingers, ears, or toes), including the more commonly recognized injuries described in the following subsections.

12.2.1.1 Chilblains Chilblains is a chronic condition affecting the skin and peripheral capillary circulation, resulting from prolonged exposure of the bare skin, primarily in the extremities, to temperatures at or below 60 °F. The best method of preventing and treating chilblains is to cover and protect the skin, thereby avoiding prolonged exposure to the cold.

12.2.1.2 Frostbite Frostbite is freezing of the hands, feet, ears, and exposed parts of the face as a result of exposure to very low temperatures. Frostbite occurs when ice crystals form in the fluid in cells of the skin and tissue. As long as blood circulation remains good, frostbite will not occur.

There are three stages of frostbite: incipient frost bite (frostnip), superficial frostbite, and deep frostbite. The classification depends on severity and can range from incipient frostbite (frostnip), which affects the skin; to superficial frostbite, which involves the skin and the tissues immediately beneath it; to deep frostbite, which is much more serious with damage that may affect deeper tissue and even bone.

Symptoms. Symptoms for each of the three stages of frostbite are described as follows.

- Frostnip. Skin first turns red and then later becomes pale or waxy white. There may be tingling, stinging, aching, an uncomfortable sensation of coldness or numbness, or no noticeable symptoms.

- Superficial Frostbite. The skin turns white or gray-white and is waxy in appearance. It is firm to touch (i.e., does not move

TABLE 2-1

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

HEALTH AND SAFETY PLAN
PART II

ESTIMATED WIND SPEED (in mph)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect.)

LITTLE DANGER
In <hour with dry skin. Maximum danger of false sense of security.

INCREASING DANGER
Danger from freezing of exposed flesh within 1 minute.

GREAT DANGER
Flesh may freeze within 30 seconds.

Trenchfoot and immersion foot may occur at any point on this chart.

Source: Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

easily) and the tissue beneath the skin is soft and resilient. There is a lack of sensation in the area.

- Deep Frostbite. The tissue is pale, cold, and solid with possible blisters and swelling. The hands and feet are especially susceptible to deep frostbite.

Emergency Treatment of Frostbite. Frostnip is easily treated in the field by the application of body heat, which should be applied before the affected area becomes numb. If frostnip affects your fingers and hands, place them against the skin of your chest or in your armpits. To warm your face, hold a mitten or scarf over the lower part of your face and breathe into it. Thaw frozen spots immediately. Do not rub affected areas.

Superficial frostbite usually responds to the application of body heat, as described previously. If the skin does not respond to body heat or if it resembles the early stages of deep frostbite, follow the emergency treatments listed in the following paragraphs. DO NOT rub affected areas.

For deep frostbite, if possible, the injured person should be taken to a heated shelter to avoid further frostbite. If it can be done without the danger of further frostbite, remove all constricting items (e.g., boots, gloves, and socks) from the injured area. RAPID REWARMING WILL MINIMIZE TISSUE LOSS. If possible, warm the extremities in a carefully controlled water bath (104 to 106 °F) until tips of the fingers or toes turn pink and feeling is restored. If a water bath is not available, either apply wet packs (100 to 112 °F) to the person's body, or gently wrap frostbitten area in blankets or some other warm material.

DO NOT attempt to thaw the affected parts by exercising them or heating them in front of an open fire, heat lamp, radiator, or stove. The person could receive a heat injury as a result of sensation loss.

DO NOT use snow to thaw frostbite. DO NOT rub, massage, or use pressure on the affected areas. Keep the frostbitten parts elevated if possible. Watch to see if CPR is necessary. Give the victim warm drinks such as tea, coffee, or soup. DO NOT GIVE ALCOHOLIC BEVERAGES. Have the victim exercise fingers or toes as soon as possible, but only after they are warmed. DO NOT allow a person with frostbitten feet to walk; walking may cause additional damage.

Medical Treatment of Frostbite.

- Frostnip. Usually does not require medical care.
- Superficial Frostbite. Blisters may require medical care.
- Deep Frostbite. EARLY MEDICAL TREATMENT IS URGENT! Transport the victim to medical care facilities at once.

Prevention of Frostbite. It is far easier to prevent or stop frostbite in earlier stages than to thaw and take care of badly frozen flesh. To protect the body against frostbite, the following precautions should be taken:

- Wear enough clothing to protect against the cold and wind.
- Wear warm gloves and boots.
- Pull a scarf or jacket flap over the lower part of the face or pull a hood tightly around the face.
- Occasionally exercise the face, fingers, and toes to keep them warm and to detect any areas that may have become numb.
- Crew members should watch each other closely, especially the face, for signs of frostbite.

12.2.1.3 Immersion Foot. Immersion foot (formerly called trenchfoot) is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground.

Symptoms. In the early stages, the feet and toes are pale, cold, numb, and stiff, and walking is difficult. If preventive action is not taken, the feet will swell and ache; in extreme cases, this may result in irreversible damage to the tissues of the foot or leg.

Emergency Treatment of Immersion Foot. Handle feet very gently. DO NOT rub or massage. If necessary, clean feet carefully with soap and warm water, then dry, elevate, and expose to warm but not hot air.

Prevention of Immersion Foot. Because the early stages of immersion foot are not painful, crew members must be constantly on the alert and check feet often when working in cold, wet conditions. Keep feet dry by wearing waterproof footgear and changing socks frequently because perspiration, trapped inside waterproof boots or heavy footgear, can contribute to immersion foot symptoms. Avoid standing in wet areas. If feet get wet, dry them as soon as possible, warm them with your hands, then use foot powder, and change to dry socks. If you cannot change wet boots and socks, exercise your feet frequently by wriggling your toes and moving your ankles. Never wear tight boots.

12.2.2 Systemic Cold Injuries Systemic injuries are those that affect the entire body system. Severe body cooling, known as systemic hypothermia, can occur at temperatures well above freezing. Hypothermia, which can be fatal, is the progressive lowering of body temperature accompanied by rapid, progressive mental and physical collapse. A large percentage of wilderness deaths are the result of hypothermia.

Hypothermia is caused by exposure to cold, and is aggravated by moisture, cold winds, fatigue, hunger, inadequate clothing or shelter, and excessive perspiration from strenuous exercise followed by too rapid cooling.

Hypothermia often occurs between temperatures of 30 to 50 °F, which most people believe are not dangerous. Crew members should be alert for symptoms of hypothermia, especially when temperatures are dropping rapidly or when they must work in rain, snow, or ice.

Hypothermia may occur on land or following submersion in even moderately cold water (i.e., 65 °F or lower). On land, hypothermia may take a full day or more of exposure to develop; however, if the conditions are extremely severe, death may occur within a few hours of initial symptoms.

In cold water, death may seem to be from drowning; in reality, it is usually the result of hypothermia. In water, skin and nearby tissues chill very fast; in 10 to 15 minutes, the temperature of the heart and brain may drop. When the core (i.e., internal body) temperature reaches 90 °F, unconsciousness may occur; when body temperature drops to 80 °F, heart failure is possible.

12.2.2.1 **Symptoms** In the early stages of hypothermia, the body begins to lose heat faster than it can be produced, making an effort to stay warm by shivering. When the body can no longer generate enough heat to overcome heat loss and the energy reserves of the body become exhausted, body temperature begins to drop. This affects the ability of the brain to make judgments and also results in loss of muscular control. As the body temperature drops, hypothermia symptoms become increasingly severe, as shown in the following table:

SYMPTOMS OF HYPOTHERMIA	APPROXIMATE CORE TEMPERATURE
Person is conscious, alert with increased respiration. Shivering may become uncontrollable as core temperature nears 95 °F.	Above 95 °F
Person is conscious but disoriented and apathetic. Shivering is present but diminishes as temperature drops. Below 92 °F, respiratory rate gradually diminishes and pupils begin to dilate.	95 to 90 °F
Person is semiconscious. Shivering is replaced by muscular rigidity. Pupils are fully dilated at about 86 °F.	90 to 86 °F
Unconscious; diminished respiration.	Below 86 °F
Barely detectable or nondetectable respiration.	Below 80 °F

12.2.2.2 **Emergency Treatment of Hypothermia** Move hypothermia victim to shelter and warmth as rapidly as possible. In very mild cases, dry clothing and shelter may be all that is needed. Gently remove all of the victim's wet clothing (so energy is not expended by warming and drying wet clothing) and replace it with a dry set. Give the person something warm to drink. DO NOT GIVE ALCOHOLIC BEVERAGES.

ALL OTHER HYPOTHERMIA CASES SHOULD BE CONSIDERED MEDICAL EMERGENCIES. PROVIDE EXTERNAL HEAT IN ANY WAY POSSIBLE! A warm bath (with the water kept between 105 and 110 °F) is the most effective way of warming a victim of hypothermia. NEVER put an UNCONSCIOUS VICTIM in a bathtub.

If it is not possible to give the person a warm bath, use one of the following.

ALTERNATE METHODS.

- Wrap warm moist towels (or other fabric) around the victim's head, neck, sides, and groin. As the packs cool, rewarm them by adding warm water (approximately 105 °F). Check the temperature of the water with your elbow or the inside of your arm; it should be warm but not hot.

- If you are at a remote outdoor location and cannot use the other method, make a "human sandwich" by placing the unclothed victim in a sleeping bag (or between blankets) with two other undressed persons to provide body-to-body heat transfer. THIS WILL SAVE LIVES. Additional sleeping bags or blankets can be placed over and under the victim.

DO NOT wrap a hypothermia victim in a blanket without an auxiliary source of heat unless it is to protect against any further heat loss before treatment can begin, or you need to go for help and there is no other alternative.

Continue treatment once the victim has stabilized. Give warm liquids and nourishing food if the person is conscious. Check the person for symptoms of frostbite and, if necessary, give treatment.

Handle the patient gently and do not allow him or her to walk. Exertion can circulate cold stagnant blood from extremities to the central body and cause "after-drop," in which the patient's core temperature drops below the level that will sustain life. ALCOHOL CONTRIBUTES TO AFTER-DROP.

12.2.2.3 **Medical Care for Hypothermia** HYPOTHERMIA IS A SEVERE EMERGENCY. GET MEDICAL TREATMENT AS SOON AS POSSIBLE. Even persons with mild hypothermia should see a doctor.

12.2.2.4 **Prevention of Hypothermia** In cold weather, never go into the field without wearing adequate clothing. Take a complete change of warm clothes and one or two extra pairs of socks (in plastic bags). Wear or carry a windproof, water-resistant outer jacket and, in rain or snow, wear adequate raingear.

Stay dry. If your clothing becomes wet from perspiration, rain, snow, or immersion in water, change it as soon as possible. If you start to shiver in a prolonged or violent way, seek shelter at once. Shivering may produce heat but it also uses up energy. Violent shivering may be an early sign of hypothermia.

Avoid accidental immersion in water. Practice boat safety and learn cold water survival techniques. If you fall into water and you are not very close to shore, remain quiet. Keep your head out of water, climb onto the boat, or hold or climb onto any other object that will support you and keep you up out of the water.

12.2.3 Safety and First Aid Equipment In view of the causes, results, and appropriate treatment of cold weather injuries discussed previously, as a minimum, the following safety equipment should be included during cold weather operations:

- extra clothing for all personnel
- blankets and/or sleeping bag
- high-energy food and drinking water supply
- toboggan
- tow ropes

In extreme cold conditions, add the following safety items:

- electric blanket (if an electrical source is available)
- portable emergency generator (with fuel, oil, and cords)
- space heater and fuel

12.2.4 General Winter Operations Cold weather conditions can severely affect winter operations. The Site Manager and HSO must plan work schedules and project tasks accordingly.

12.2.4.1 Preliminary Assessment If you will be working outdoors in cold weather, assess the local weather conditions through the news media (i.e., radio, television, and newspapers) to determine whether work should progress and the amount of preparation needed. Carefully consider questions such as the following.

- What are the typical wind and weather conditions for the period in which you will be working?
- Are the areas in which you will work sheltered or open to the wind?
- Is there a place nearby for periodic warming breaks? Can you obtain or heat warm food and beverages there? Is there a source of drinking water?
- Are there ways to minimize the length of time that crew members will have to work outdoors in the cold?

- If you use a vehicle for a warming area or will use a heater in a closed room, how can you ensure there is adequate ventilation to prevent carbon monoxide poisoning?

12.2.4.2 **Scheduling** Wherever possible, try to schedule work during the least severe weather. Rotate crew members to keep cold exposures short and allow sufficient time for frequent warming breaks. Remember that workers in heavy clothing often need more time to complete the tasks and may become fatigued more easily. Be aware that operations may have to be discontinued if winds increase or the temperature drops.

Because winter days are short, scheduling should allow time for taking care of equipment and supplies before nightfall. Once it becomes dark, it is more difficult to gauge terrain, and temperatures are likely to drop.

12.2.4.3 **Site Access** Snow and ice could make travel on site access roads impossible, or treacherous at best. Personnel should not be allowed to work on-site if conditions could severely hamper the arrival or departure of emergency vehicles. If the route to off-site medical facilities is blocked by snow or ice, an otherwise minor injury could result in a major medical emergency. If conditions warrant, the following provisions should be made:

- snow removal and plowing services for site access roads;
- a dependable, four-wheel-drive vehicle available to on-site personnel for transporting an injured person to an off-site medical facility; and
- sleeping bags, blankets, a food supply, and water kept on-site in the event a sudden storm requires personnel to remain overnight

The HSO is responsible for deciding when weather conditions make site access unsafe, thereby requiring work to stop until conditions improve.

12.2.4.4 **Equipment and Supplies** Obtain equipment and supplies that will help prevent cold stress and will help in the treatment of cold stress disorders. Required equipment includes a reliable ambient temperature thermometer, a wind gauge, and a windchill chart. If the site is potentially windy due to a lack of natural or manmade windbreaks (e.g., trees, valleys, and structures), try to provide means of shielding workers from the wind. If working at a remote location, carry extra food and water because hunger and dehydration contribute to cold stress. If possible, make provisions for hot food and beverages. Ensure that emergency communication equipment is available and operational for crew members working in the cold, at heights, or in remote locations.

Close attention must be given to the effects of cold weather on field equipment. Batteries can be severely affected by cold resulting in disabled radios, air monitoring equipment, sampling pumps, and vehicles. A supply of fresh batteries, a sufficient number of charging units, and a set of automotive jumper cables should be maintained on-site. In addition, the electronics in many field instruments such as PI, LEL, and oxygen meters, as well as the chemical reactions

in detector tubes (e.g., Draeger tubes) can also be adversely affected by the cold. The manufacturers' literature must be consulted for minimum operating temperatures.

If at all possible, monitoring well sampling tasks should not be scheduled during cold weather. These tasks generally require the use of relatively delicate pumps; long, uninsulated stretches of tubing; and significant quantities of decontamination solutions. Unless considerable effort is expended to prevent pumps, hoses, decontamination solutions, and sample containers from freezing, attempting to sample monitoring wells in cold weather may be counter-productive. Portable shelters should be considered if cold weather sampling is necessary.

CHAPTER 13. DECONTAMINATION

13.1 PERSONNEL DECONTAMINATION. Decontamination procedures are followed by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. A typical personnel decontamination station is shown in Figure 13-1. Generalized procedures for removal of protective clothing are as follows.

1. Drop tools, monitors, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).

2. Step into the designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.

3. Scrub outer boots and outer gloves with decon solution or detergent and water. Rinse with water.

4. Remove tape from outer boots and remove boots; discard tape and boots in disposal container.

5. Remove tape from outer gloves and remove gloves; discard tape and gloves in disposal container.

6. If the worker has left the Exclusion Zone to change the air tank on the SCBA or the canister on the air-purifying respirator, this will be the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, and the joints taped; the worker then returns to duty.

7. Remove outer garments and discard in disposal container.

8. Remove respirator and place or hang in the designated area.

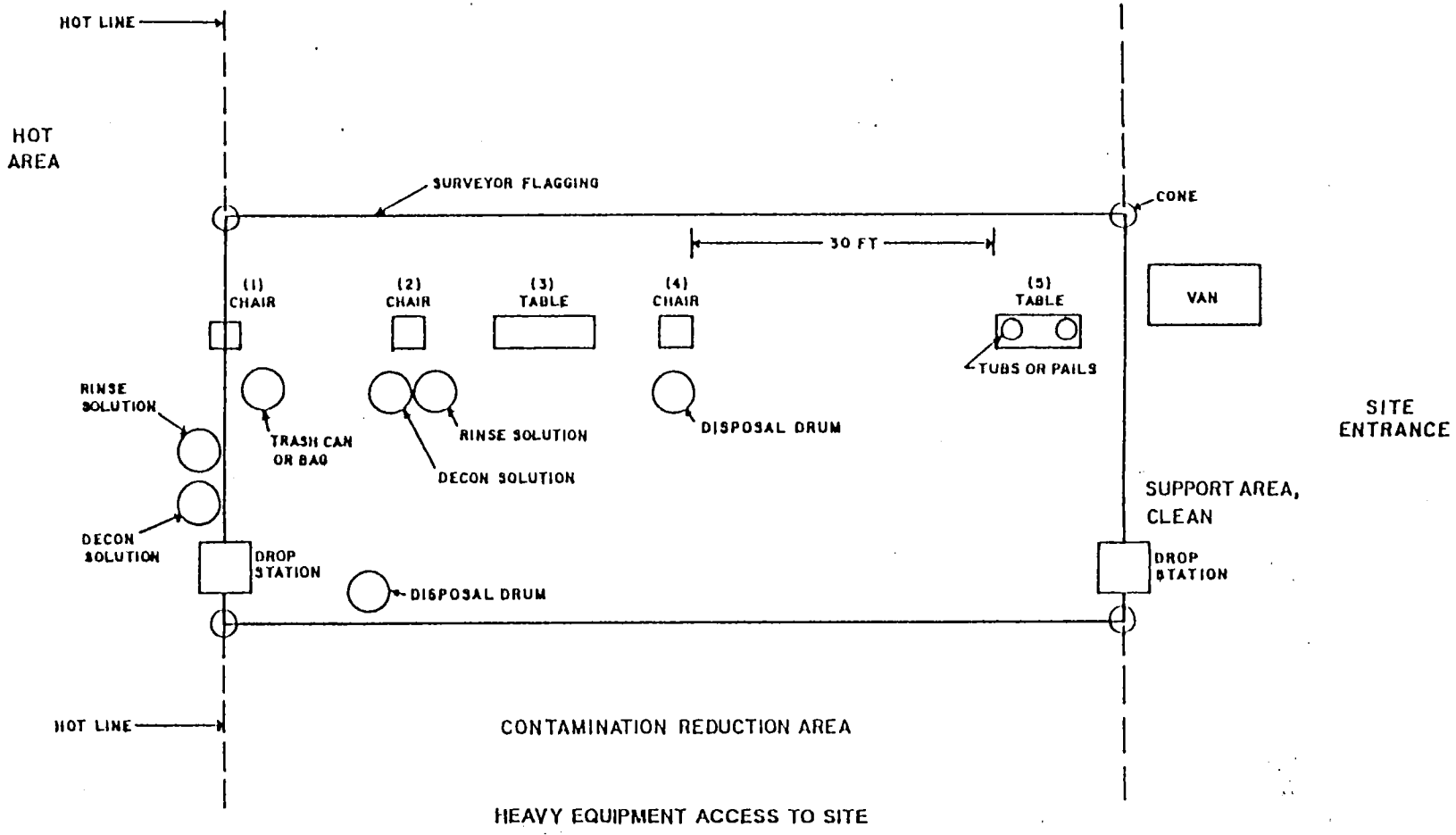
9. Remove inner gloves and discard in disposal container.

10. If the site requires use of a decontamination trailer, all personnel must shower before leaving the site at the end of the work day.

NOTE: Disposable items (i.e., Tyvek™ coveralls, inner gloves, and latex overboots) will be changed daily unless there is reason to change sooner. Dual respirator canisters will be changed daily, unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Maximum and minimum decontamination layouts for PPE Levels A through C are shown in Figures 13-2 through 13-6.

Pressurized sprayers or other designated equipment will be available in the decontamination area for washdown and cleaning of personnel, samples, and equipment.



TASK

(1) WASH OUTER BOOTS - RINSE BOOTS - DISPOSE
(2) WASH OUTER GLOVES - RINSE GLOVES - DISPOSE
(3) SCBA TANK CHANGE OVER TABLE W/SPARE TANKS
(4) REMOVE OUTER GARMENT - DISPOSE
(5) REMOVE SCBA, WASH MASK IN PAILS OR TUBS
(6) REMOVE INNER GLOVES - DISPOSE

NOT TO SCALE

FIGURE 13-1
TYPICAL PERSONNEL DECONTAMINATION STATION

FIGURE 13-2
Maximum Decontamination Layout
Level A Protection

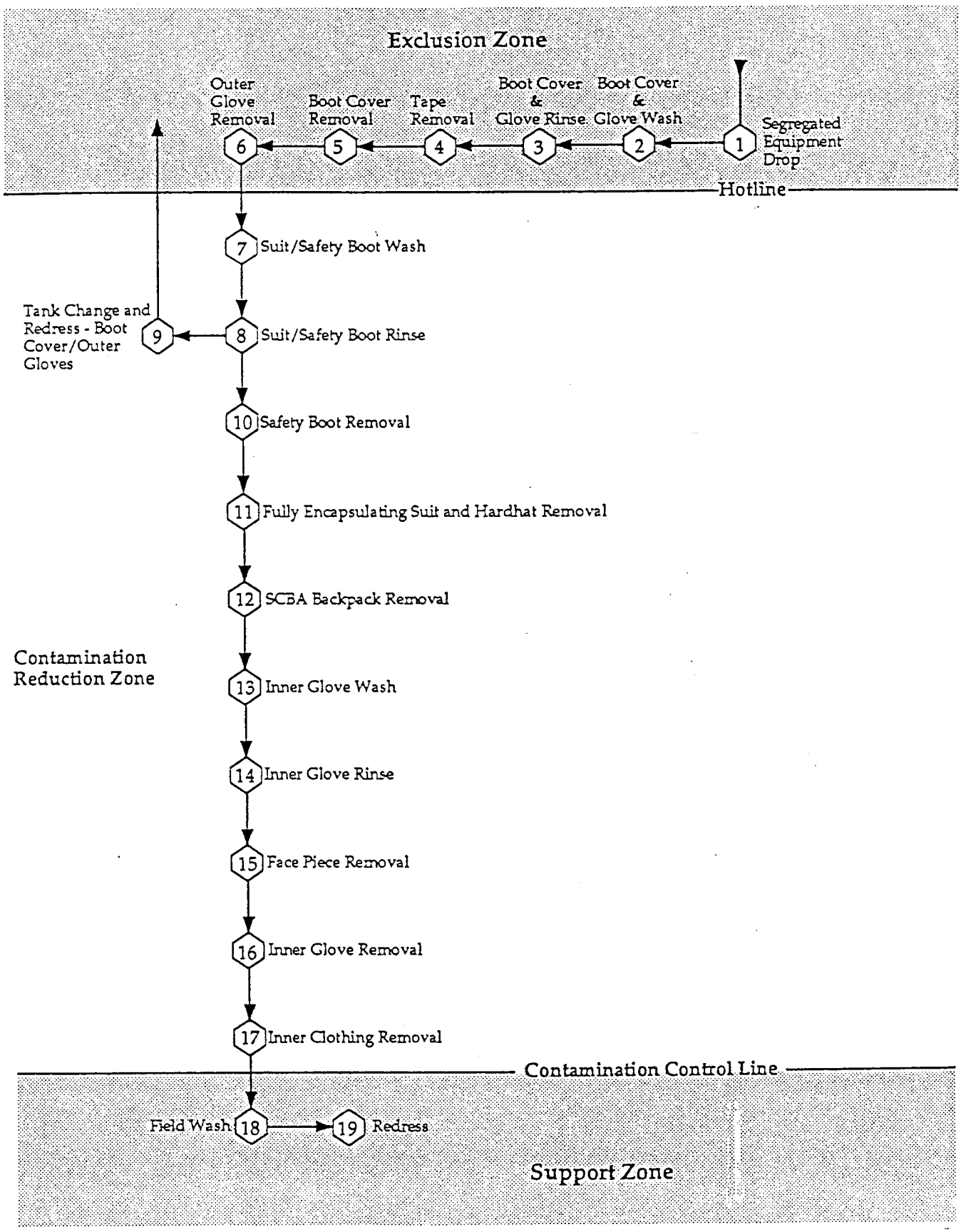


FIGURE 13-3

Maximum Decontamination Layout
Level B Protection

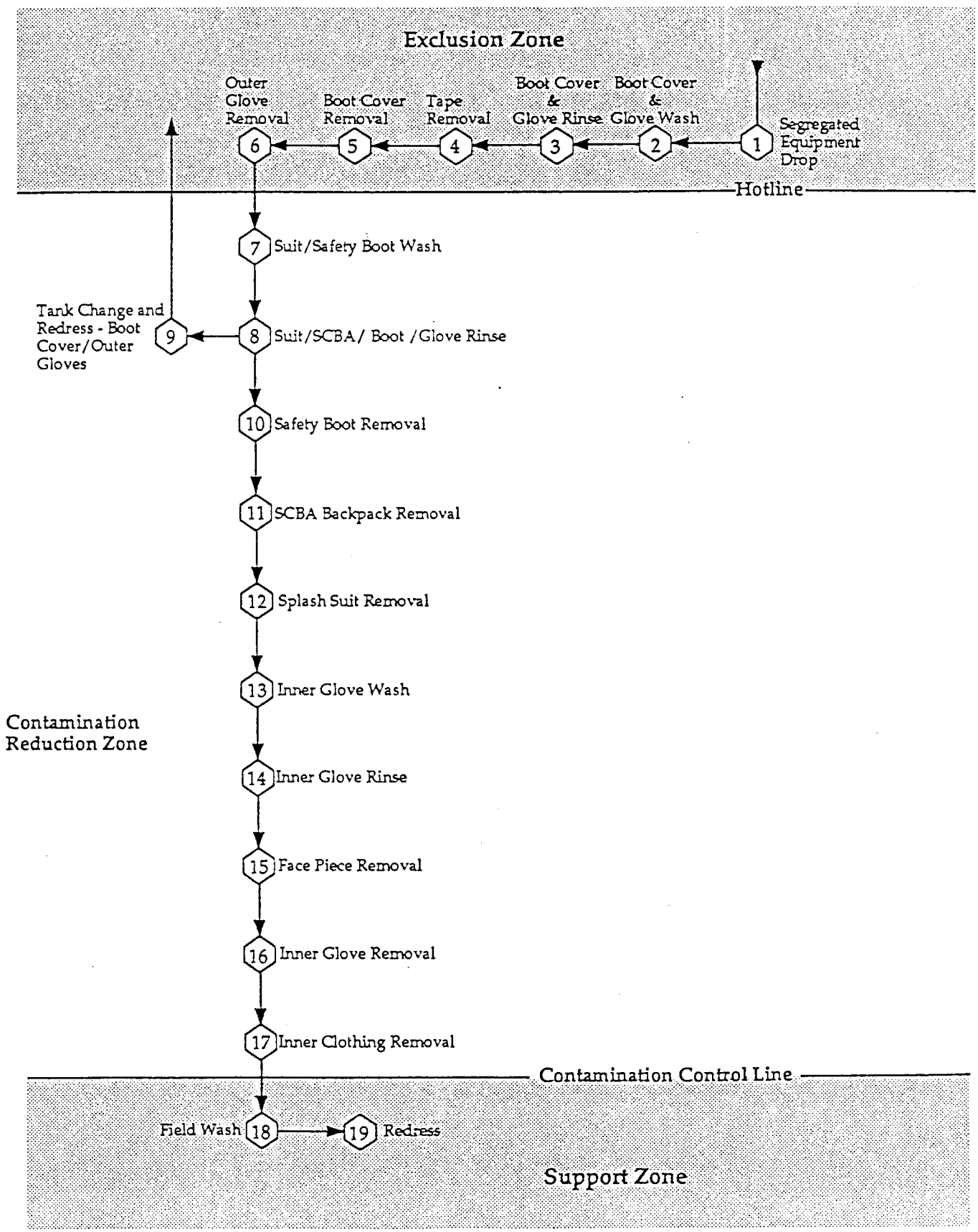


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FIGURE 13-4

Maximum Decontamination Layout
Level C Protection

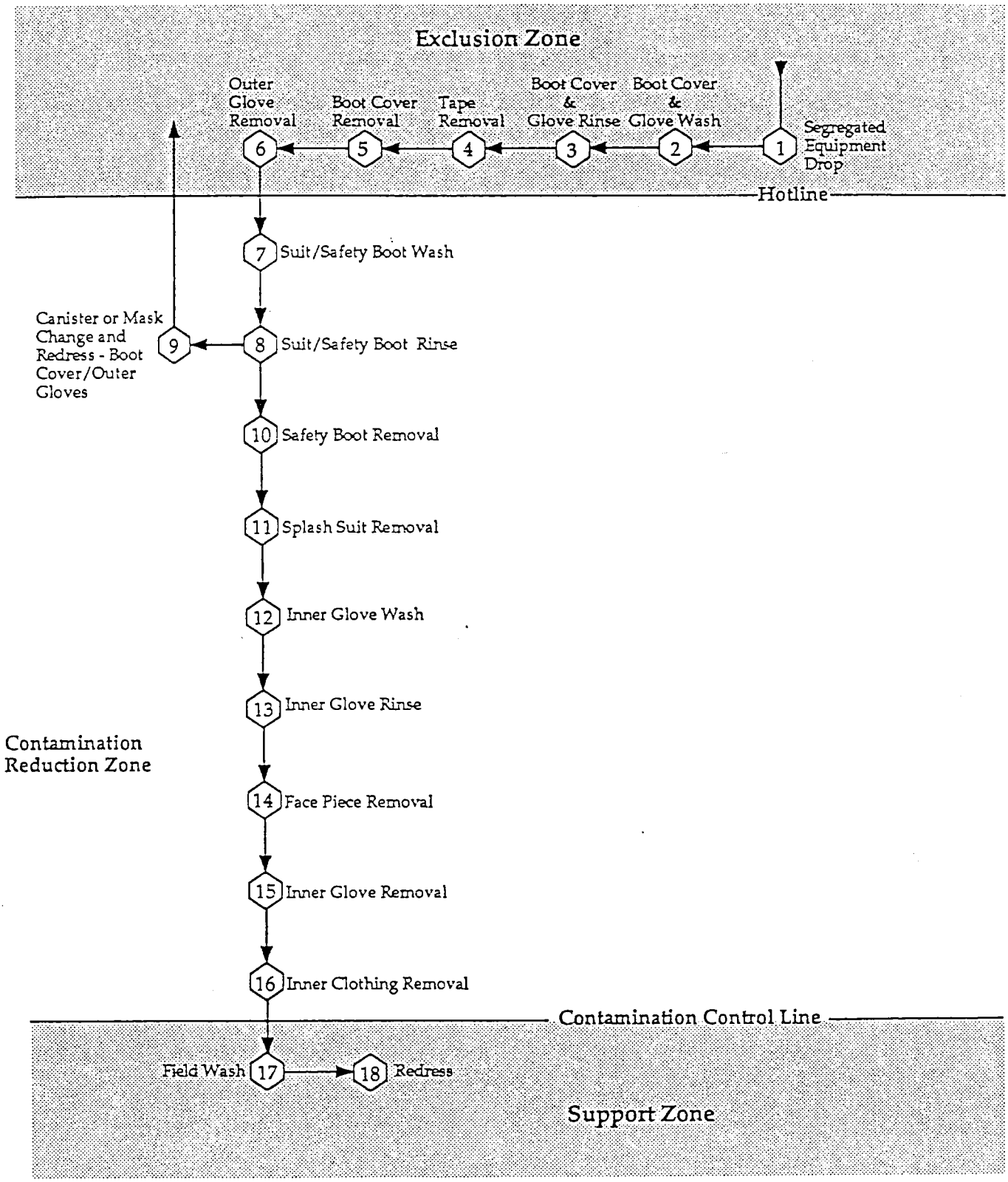


FIGURE 13-5

Minimum Decontamination Layout
Levels A and B Protection

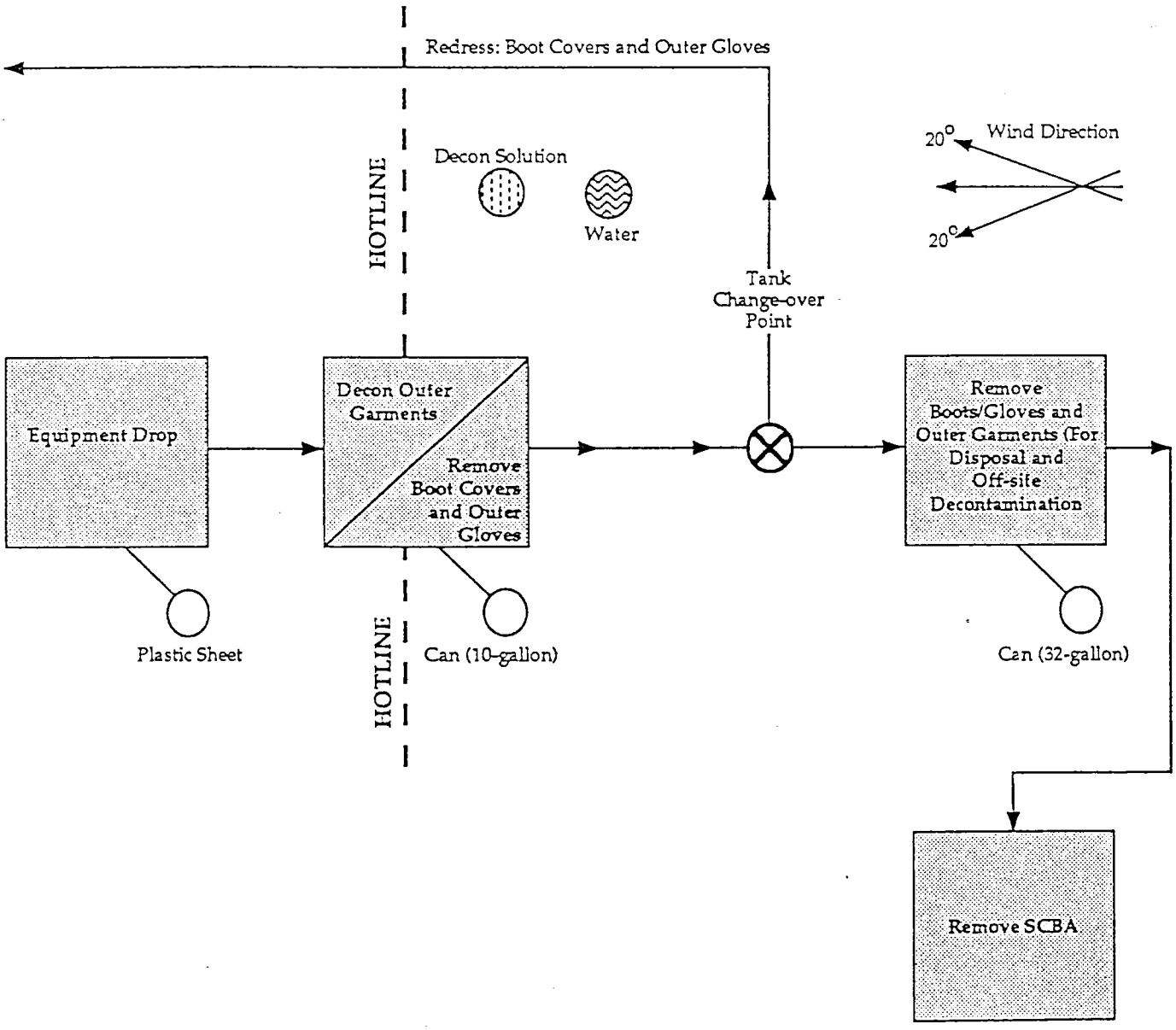
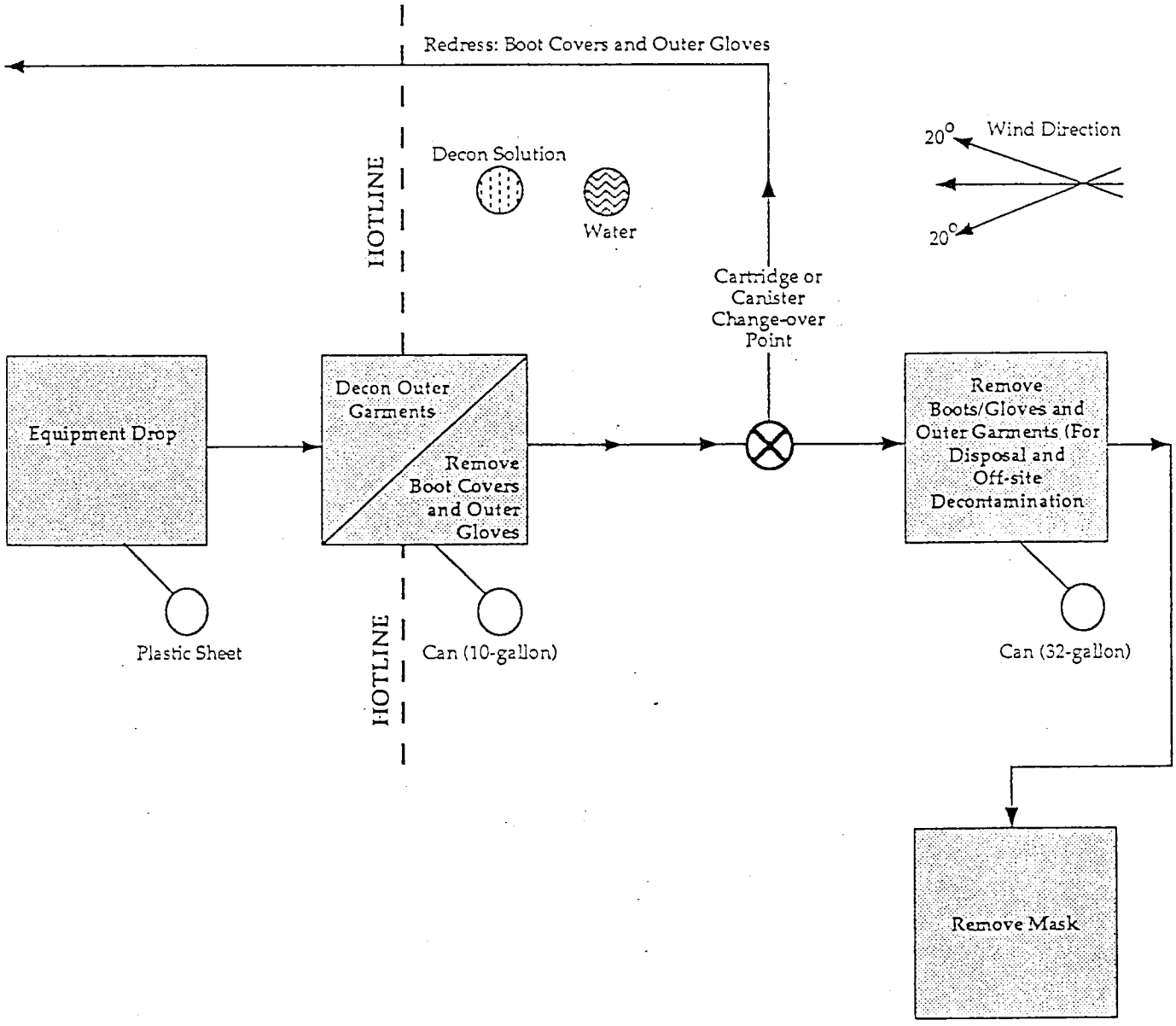


FIGURE 13-6

Minimum Decontamination Layout
Level C Protection



Respirators will be decontaminated daily and taken from the drop area. The masks will be disassembled, the cartridges set aside, and all other parts placed in a cleansing solution. Parts will be pre-coded (e.g., #1 on all parts of Mask #1). After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be marked to indicate length of use (i.e., if it is possible to evaluate the remaining utility of the cartridge), or discarded in the contaminated trash container for disposal. In the morning, the masks will be reassembled and new cartridges installed, if appropriate. Personnel will inspect their own masks and readjust the straps for proper fit.

13.2 SMALL EQUIPMENT DECONTAMINATION. Small equipment will be protected from contamination as much as possible by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible), without hindering operation of the unit. For example, the HNU meter can be placed in a clear plastic bag to allow for reading the scale and operating the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings will be removed and disposed of in appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and re-charged as necessary for the next day's operation, and then prepared with new protective coverings.

13.3 HEAVY EQUIPMENT DECONTAMINATION. It is anticipated that drilling rigs and backhoes will become contaminated during borehole and test-pitting activities. They will be cleaned with high-pressure water or steam, followed by a soap and water wash and rinse. Loose material will be removed with a brush. The person performing this activity will usually be at least at the level of protection used during the personnel and monitoring equipment decontamination.

A decontamination pad will be constructed to allow collection and storage of contaminated decontamination fluids in Department of Transportation (DOT)-approved 55-gallon drums.

13.4 DISPOSAL OF DECONTAMINATED MATERIALS. All protective gear, decontamination fluids (for both personnel and equipment), and other disposable materials will be disposed of at each site.

Decontamination fluids (i.e., Liqui-nox™, used to decontaminate sampling equipment such as split spoons and groundwater sampling pumps) will be stored in DOT-approved 55-gallon drums. Disposable materials (e.g., gloves and Tyveks™) will be double-bagged and stored as is, or placed in DOT-approved 55-gallon drums.

CHAPTER 14. EMERGENCY PLANNING

14.1 EMERGENCY MEDICAL SERVICES. Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their ability to provide for the needs of on-site project staff and notified of site operations as appropriate. Criteria such as emergency department physician coverage, decontamination capabilities, and available medical specialists will be evaluated.

14.1.1 On-site First Aid An industrial first-aid kit will be provided at the work site; contents of the kit will be checked weekly and restocked as necessary. Other equipment may include oxygen, backboard and straps, splints, and a cervical collar.

At least one person qualified to perform first aid will be present on-site at all times during work activity. This person will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. Designated first aides will receive regular review training from the American Red Cross or the equivalent.

An emergency shower and eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, and tools.

14.1.2 Transportation to Emergency Treatment A vehicle will be available at all times to transport personnel to the hospital (in the event an ambulance is unnecessary or unavailable). Stretchers will be located at the work site to transport personnel to the vehicle. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

14.2 CONTINGENCY PLANNING. Prior to commencement of on-site activities, the HSO will review safety considerations with the field crew. The HSO has overall responsibility for adherence to the designated safety precautions and assumes the role of on-site coordinator in an emergency response situation.

All on-site personnel will be familiar with both the primary and secondary route to the nearest hospital (which may be shown on a figure or a local map), as well as the location of the nearest working telephone or radio communication device. At remote locations a mobile phone or radio will be provided. A list of emergency telephone numbers will be readily available on-site.

When extensive Level B operations are planned, the local hospital and emergency response team will be advised in advance of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Environmental Medicine Resources, Inc.

Emergency communication will be required to ensure positive preplanned notification of emergency authorities in the event of episodes requiring initiation of contingency plans. Emergency communication will include all or parts of the following.

- Coordinate with local agencies, fire and police departments, the ambulance service, and the hospital emergency room.

- Establish two-way radio communication and a site alarm capable of warning site personnel and summoning assistance (i.e., airhorn).

- Design an emergency evacuation plan for residents of nearby homes. Although evacuation is an unlikely event, as a contingency, the HSO will be designated as on-site coordinator and will be responsible for implementing the plan. The HSO will be made aware of the total number of households within a 2,000-foot radius. The Health and Safety Plan will provide the emergency contacts required and a table will provide a list of residences and identifiable operations in the area in the event that evacuation is deemed a possibility for a particular site.

- Investigate possible routes of evacuation prior to any activity.

- If an accident occurs, a copy of an accident report form, provided in Chapter 15, should be filled out by the HSO and filed with the individual's supervisor, the HSM or HSS, and Human Resources. A copy should also be retained in the project records.

14.3 POTENTIAL HAZARDS. The most common hazards associated with hazardous waste site investigation include (1) accidents; (2) inhalation, contact, or ingestion of hazardous materials; (3) explosion; and (4) fire.

14.3.1 Accidents Accidents must be handled on a case-by-case basis. Minor cuts, bruises, muscle pulls, and the like will still allow the injured person to undergo reasonably normal decontamination procedures before receiving direct first aid. More serious injuries may not permit complete decontamination procedures to be undertaken, particularly if the nature of the injury is such that the victim should not be moved. In these cases, arrangements will be made with the medical facility and transporter to allow them to take proper precautions. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim on-site without undue hazard. However, if on-site access is limited, accident victims may be transported by ABB-ES personnel trained for this response to a point accessible by an ambulance.

14.3.2 Contact and/or Ingestion of Hazardous Materials Properly prescribed and maintained protective clothing and adherence to established safety procedures are designed to minimize this hazard. However, it is still possible that contact or ingestion of materials may occur. For example, puncture of a buried drum of liquid during drilling operations might cause the drum contents to contact personnel. Standard first-aid procedures should be followed. The drilling rig will have a tank of water that may be useful in some circumstances, particularly to flush contaminants from any exposed skin areas. Eye-wash bottles will also be maintained at the site for emergencies. In cases of ingestion or anything other than minor contact with known substances, the local Poison Control Center

and hospital should be notified and the victim taken there immediately for further treatment and observation.

14.3.3 Explosion The drilling crew should be keenly aware of combustible gas meter readings and should withdraw at any indication of imminently hazardous conditions (i.e., greater than 20 percent LEL). The detection of such conditions will be reported to local agencies for potential execution of the evacuation plan, if the situation is assessed to warrant such response.

14.3.4 Fire The combustible gas meter also warns of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling the fluids (e.g., methanol and acetone) used for certain decontamination procedures. No smoking or open flames are allowed on-site. Carbon dioxide fire extinguishers will be kept at the drilling rig and in the decontamination area/field office. The fire department, previously informed of site activities, will be called as needed.

14.4 EVACUATION RESPONSE LEVELS. Evacuation responses will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind), (2) site evacuation, and (3) evacuation of surrounding area. Anticipated conditions that require these responses are described in the following subsections.

14.4.1 Withdrawal Upwind (100 Feet or More) Withdrawing upwind (100 feet or more) will be required when (1) ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn (the work crew may return after donning greater respiratory protection and/or assessing the situation as transient and past); (2) a breach in protective clothing or minor accident occurs (the work crew may return when the tear or other malfunction is repaired and first aid or decontamination has been administered); or (3) the respirator malfunctions requiring replacement.

14.4.2 Site Evacuation Evacuation of the site will be required when (1) ambient air conditions contain explosive and persistent levels of combustible gas or excessive levels of toxic gases; (2) a fire or major accident occurs; or (3) explosion is imminent or has occurred.

14.4.3 Surrounding Area Evacuation The area surrounding the site will be evacuated when persistent, unsuppressible toxic or explosive vapors from test pits or borings (e.g., pressure release from punctured drum) are released, or air quality monitored at several points downwind assess danger to the surrounding area.

14.5 EVACUATION PROCEDURES

14.5.1 Withdrawal Upwind The work crew will continually observe general wind directions while on-site. (A simple wind sock may be set up near the work site for visual determinations.) Upon observing conditions that warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or farther, as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the HSO and a member of the crew may return to the

work site to determine whether the conditions noted were transient or persistent. If persistent, an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The HSM, HSS, and client will be notified of conditions. When access to the site is restricted and escape is thereby hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

14.5.2 Site Evacuation After determining that site evacuation is warranted, the work crew will proceed upwind of the work site and notify the security force, HSO, and field office of site conditions. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation, where the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, they will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and implemented by the HSO.

14.5.3 Evacuation of Surrounding Area When the HSO determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

CHAPTER 15. HEALTH AND SAFETY FORMS AND DATA SHEETS

This chapter contains examples of ABB-ES's Health and Safety Audit Form, Accident Report Form, HSO checklist for Field Operations, Material Safety Data Sheets for Liqui-nox™ and trisodium phosphate, OSHA's Job Safety and Health Protection notice, and ABB-ES's Daily Health and Safety Audit Form.

15.1 HEALTH AND SAFETY AUDIT FORM

Site Name: _____ Date _____

Auditor: _____

SEND A COPY OF COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER.

GENERAL	YES	NO	COMMENTS
HASP on-site?	___	___	_____
HASP completely signed off and approved?	___	___	_____
OSHA poster posted in trailer?	___	___	_____
Emergency telephone numbers posted in trailer?	___	___	_____
Emergency eyewash on-site?	___	___	_____
Emergency shower on-site?	___	___	_____
Stretcher on-site?	___	___	_____
First-aid kit on-site?	___	___	_____
Adequately stocked?	___	___	_____
Proper sanitation facilities?	___	___	_____
DOCUMENTATION AND RECORDKEEPING			
Only personnel listed and approved in HASP on-site?	___	___	_____
All personnel properly trained?	___	___	_____
All personnel in health monitoring program?	___	___	_____
Daily field records kept by the Site Manager?	___	___	_____
Levels of PPE recorded?	___	___	_____
Contaminant levels recorded?	___	___	_____
Site surveillance records kept by HSO?	___	___	_____

DOCUMENTATION AND RECORDKEEPING (Cont)	YES	NO	COMMENTS
Calibration records maintained?	___	___	_____
Accident/incident forms on-site?	___	___	_____
Field team review sheets signed?	___	___	_____
Medical data sheets completed?	___	___	_____
Spare hospital directions available?	___	___	_____
Visitors logbook completed?	___	___	_____
MSDSs for chemicals on-site?	___	___	_____
HASP revisions recorded?	___	___	_____
First-aid kit inspected weekly?	___	___	_____
Are daily safety meetings held?	___	___	_____
Emergency procedures discussed during safety meetings?	___	___	_____
EMERGENCY RESPONSES			
Vehicle available on-site for transportation to the hospital?	___	___	_____
Fire extinguishers on-site?	___	___	_____
At least two persons trained in CPR and first-aid on-site at all times?	___	___	_____
All personnel know who is trained?	___	___	_____
PERSONNEL PROTECTIVE EQUIPMENT			
Proper PPE being worn as specified in the HASP?	___	___	_____
Level of PPE being worn:			_____
PPE adequate for work conditions?	___	___	_____
If not, give reason:			_____
Upgrade/downgrade to PPE level:			_____

PERSONNEL PROTECTIVE EQUIPMENT (Cont.)	YES	NO	COMMENTS
Has facial hair that would interfere with fit of respirators been removed?	___	___	_____
If not, willing to shave if necessary?	___	___	_____
Fit-tested within the last year?	___	___	_____
If Level B, back-up/emergency person suited up (except for air)?	___	___	_____
HSO periodically inspects PPE and equipment?	___	___	_____
PPE not in use properly stored?	___	___	_____
MONITORING EQUIPMENT			
All equipment listed in HASP on-site?	___	___	_____
Properly calibrated?	___	___	_____
In good condition?	___	___	_____
Used properly?	___	___	_____
Other equipment needed?	___	___	_____
List: _____			
Monitoring equipment covered with plastic to minimize contamination?	___	___	_____
DECONTAMINATION			
Decon line set up properly?	___	___	_____
Proper cleaning fluid used for known or suspected contaminants?	___	___	_____
Proper decon procedures used?	___	___	_____
Decon personnel wearing proper PPE?	___	___	_____
Equipment decontaminated?	___	___	_____
Samples decontaminated?	___	___	_____
Disposable items changed twice a day or more often if needed?	___	___	_____

WORK PRACTICES	YES	NO	COMMENTS
Proper collection and disposal of contaminated PPE?	___	___	_____
Proper collection and disposal of decon fluid?	___	___	_____
Water available for decon?	___	___	_____
Buddy system used?	___	___	_____
Equipment kept off drums and ground?	___	___	_____
Kneeling or sitting on drums or ground not allowed?	___	___	_____
Personnel avoid standing or walking through puddles or stained soil?	___	___	_____
Zones established?	___	___	_____
If night work to be conducted, adequate illumination?	___	___	_____
Smoking, eating, or drinking in the Exclusion Zone or CRZ not allowed?	___	___	_____
To the extent feasible, contaminated materials handled remotely?	___	___	_____
Contact lenses not allowed on-site?	___	___	_____
Entry into excavations not allowed unless properly shored or sloped?	___	___	_____
All unusual situations on-site listed in HASP?	___	___	_____

If not, what? _____

Action taken? _____

HASP revised?	___	___	_____

CONFINED SPACE ENTRY

All confined spaces identified?

If not, list: _____

CONFINED SPACE ENTRY	YES	NO	COMMENTS
All appropriate equipment available and in good working order?	___	___	_____
Equipment properly calibrated?	___	___	_____
Confined Space Checklists used?	___	___	_____
Checklists completely and correctly filled out?	___	___	_____

15.2 ACCIDENT REPORT FORM

Site: _____ Project No.: _____
Location: _____
Location of Accident if different from above: _____
_____
Name and Address of Injured: _____
_____
SSN: _____ DOB: _____ Sex: _____
Years of Service: _____ Time on Current Job: _____ Dept. No.: ____
Title/Classification: _____
Date of Accident: _____ Time of Accident: _____
Name of Witness: _____ Telephone No.: _____

Accident Category: __ Motor Vehicle __ Property Damage __ Fire
__ Chemical Exposure __ Near Miss __ Other

Severity of Injury or Illness __ Non-disabling __ Disabling
__ Medical Treatment __ Fatality

Amount of Damage: $ _____ Property Damaged: _____

CLASSIFICATION OF INJURY

__ Fracture
__ Dislocation
__ Sprain
__ Abrasion
__ Laceration
__ Puncture
__ Bite
__ Respiratory Allergy
__ Other (explain) _____

__ Heat Burn
__ Chemical Burn
__ Radiation Burn
__ Concussion
__ Toxic-Respiratory
__ Toxic-Ingestion
__ Toxic-Dermal

__ Cold Exposure
__ Heat Stroke
__ Faint/Dizziness
__ Blister
__ Bruise
__ Poison Ivy
__ Headache

Parts of Body Affected: _____

Degree of Disability: _____

Date Medical Care Received: _____ Emergency Service?: _____

Name and Address of Medical Facility: _____
_____

Follow-up Exam Required?: _____ Estimated No. of Days Away from Job: _____

ACCIDENT LOCATION (use other side of sheet as needed)

Causative agent most directly related to accident (i.e., object, substance, material, machinery, equipment, and conditions):

Was weather a factor? How?

Unsafe mechanical/physical/environmental condition at time of accident (be specific):

Unsafe act by injured person and/or others contributing to the accident (be specific, must be answered):

Personal factors (improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, horseplay):

MODIFICATIONS

Level of personal protective equipment required in site safety plan: _____
Was injured person using required equipment? _____
If not, how did actual equipment use differ from plan?

Was personal protective equipment required in site safety plan adequate for site conditions? _____

If no, what additional equipment was needed?:

What can be done to prevent a reoccurrence of this type of accident (i.e., modification of machine, mechanical guards, modification of work practices, training)?:

DETAILED NARRATIVE DESCRIPTION (How did accident occur and why; objects, equipment, tools used, circumstances, assigned duties; be specific):

Signature of Preparer: _____ Date: _____

Signature of Site Manager: _____ Date: _____

SEND COPIES OF COMPLETED FORM TO HUMAN RESOURCES
AND THE HEALTH AND SAFETY MANAGER OR SUPERVISOR.

15.3 HSO CHECKLIST FOR FIELD OPERATIONS

The following is a list of the minimum equipment and materials needed to fulfill the requirements for health and safety at a site. This list does not include monitoring equipment, decontamination equipment, or personal health and safety equipment (e.g., respirators, tyveks, and boots).

Need	Posted?	Paperwork
☐		Health and Safety Plan
☐		Health and Safety Plan Appendix
☐		Field Team Review Sheets
☐		Medical Data Sheets
☐	☐	OSHA Job Safety & Health Protection Poster
☐	☐	Emergency Information Sheet
☐	☐	Spare Hospital Directions
☐		Blank Accident Report Forms
☐		Visitors Logbook
☐		H & S Audit Form
☐		Confined Space Entry Forms
☐		Site-specific HASP Attachments
		MSDSs for Chemicals Taken On-site (other than those in HASP Appendix)
☐		1.
☐		2.

Need	Quantity	Equipment
☐	☐	First Aid Kit
☐	☐	Emergency Eye Wash Station
☐	☐	Fire Extinguisher
☐	☐	Emergency Horn
☐	☐	Emergency Stretcher/Backboard

FR...: ALCOMOX, Inc.

Quality Dispersants for Labor Intensive Hazardous Industries

215 PARK AVENUE ... NEW YORK ...

TO: CE Environmental

ATTN Bill Thurston

FAX: 207-773-0011

DATE: 1/19/90

PAGE 1 OF 6

FROM: Malcolm

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration

(Non-Mandatory Form)

Form Approved

OMB No. 1218-0072

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Identity (As Used on Label and List): LIQUI-NOX

Manufacturer's Name: ALCOMOX, INC.

Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH, NEW YORK, NEW YORK 10003

Emergency Telephone Number: (212) 473-1308

Telephone Number for Information: (212) 473-1300

Date Prepared: JULY 1, 1987

Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN LIQUI-NOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	214°F	Specific Gravity (H_2O = 1)	1.075
Vapor Pressure (mm Hg.)	NO DATA	Melting Point	N.A.
Vapor Density (Air = 1)	NO DATA	Evaporation Rate (Butyl Acetate = 1)	NO DATA

Solubility in Water: COMPLETELY SOLUBLE IN ALL PROPORTIONS

Appearance and Odor: YELLOW LIQUID - PRACTICALLY ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used): NONE (CLEVELAND OPEN CUP)

Flammable Limits: LEL N.A. UEL N.A.

Extinguishing Media: WATER, DRY CHEMICAL, FOAM, CO_2, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL, DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards: NONE

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		NONE
	Stable	XX	

Incompatibility (Materials to Avoid): NONE

Hazardous Decomposition or Byproducts: SO_2 MAY BE RELEASED ON BURNING

Hazardous Polymerization			Conditions to Avoid
	May Occur		NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Routes of Entry:	Inhalation?	Skin?	Ingestion?
	NO	YES	YES

Health Hazards (Acute and Chronic): SKIN CONTACT MAY PROVE LOCALLY IRRITATING.

INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

Signs and Symptoms of Exposure: PROLONGED SKIN CONTACT MAY CAUSE DRYING AND/OR CHAPPING.

Medical Conditions Generally Aggravated by Exposure: NONE

Emergency and First Aid Procedures: EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES. SKIN-FLUSH WITH WATER.

INGESTION-DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR DISC[OMFORT]

Section VII — Precautions for Safe Handling and Use

Steps To Be Taken In Case Material Is Released or Spilled: MATERIAL FOAMS PROFUSELY. RECOVER AS MUCH AS POSSIBLE WITH ABSORBENT MATERIAL AND RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADAB[LE]

Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE SOAKED UP WITH ABSORBENT MATERIAL AND DISPOSED OF ACCORDING TO LOCAL, ORDINA[NCES]

Precautions To Be Taken In Handling and Storing: NONE REQUIRED -VISCOSITY OF MATERIAL INCREASES AT VERY LOW TEMPERATURES.

Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL

Section VIII — Control Measures

Respiratory Protection (Specify Type):

Ventilation		
Local Exhaust: NORMAL	Special: N.A.	
Mechanical (General): N.A.	Other: N.A.	

Protective Gloves: RECOMMENDED

Eye Protection: RECOMMENDED

Other Protective Clothing or Equipment: NOT REQUIRED

Work/Hygienic Practices: NO SPECIAL PRACTICES REQUIRED

Page 2

15.4.1 LIQUI-NOX

Monsanto MATERIAL SAFETY DATA

NER CODE A-111

MONSANTO PRODUCT NAME

TRISODIUM PHOSPHATE CRYSTALLINE

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167

Emergency Phone No.
(Call Collect)
314-694-1000

PRODUCT IDENTIFICATION

Synonyms:	TSP/C; Trisodium orthophosphate; Sodium phosphate, tribasic; Phosphoric acid, trisodium salt; Trisodium phosphate dodecahydrate
Chemical Formula:	$Na_3PO_4 \cdot 12H_2O \cdot 1/4\ NaOH$ (approximately)
CAS No.:	10101-89-0*
DOT Proper Shipping Name:	Sodium Phosphate, Tribasic (see NOTE below)
DOT Hazard Class/ I.D. No.:	ORM-E/NA9148
DOT Label(s):	Not Applicable
Hazardous Substance(s)/ RQ(s):	Yes/5,000 lbs.
U.S. Surface Freight Classification:	Trisodium Phosphate

Note: Bagged material is not regulated.

*Since hydrated materials could not be reported on the TSCA Initial Inventory List, Trisodium Phosphate Crystalline was reported as anhydrous with the CAS No. 7601-54-9.

WARNING STATEMENTS

DANGER!
CAUSES EYE BURNS
CAUSES SKIN IRRITATION

PRECAUTIONARY MEASURES

Do not get in eyes, on skin, on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID: IF IN EYES, immediately flush with plenty of water for at least 15 minutes. Call a physician.

IF ON SKIN, immediately flush with plenty of water. Remove contaminated clothing. Wash clothing before reuse.

MATERIAL SAFETY DATA — TRISODIUM PHOSPHATE CRYSTALLINE

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Wear chemical safety goggles to prevent eye contact. Have eye baths immediatey available where eye contact can occur.

Skin Protection: Wear appropriate impervious gloves and protective clothing to prevent skin contact. Launder contaminated clothing and clean protective equipment before reuse.

Respiratory Protection: Use NIOSH approved equipment suitable for nuisance dust when airborne exposure is excessive. Consult respirator manufacturer to determine appropriate type equipment for given application.

Ventilation: Provide ventilation to minimize exposure. Local exhaust ventilation preferred.

Airborne Exposure Limits: Product: Trisodium phosphate dodecahydrate

Although no specific exposure limit has been established for this material, OSHA and ACGIH have established limits for nuisance dusts:

OSHA PEL/TWA: Total 15 mg/m^3; Respirable 5 mg/m^3
ACGIH-TLV/TWA: Total 10 mg/m^3; Respirable 5 mg/m^3

Keep exposure below these limits.

FIRE PROTECTION INFORMATION

This material is not combustible.

REACTIVITY DATA

Materials to Avoid: Trisodium Phosphate Crystalline could be corrosive to aluminum surfaces because of high pH. Sealed containers should be kept free of water because of its corrosivity when wet.

Hazardous Decomposition Products: None.

Hazardous Polymerization: Does not occur.

PHYSIOLOGICAL EFFECTS SUMMARY

Oral LD_{50} (Rat): 6,500 mg/kg, Practically Nontoxic
Dermal LD_{50} (Rabbit): 7,940 mg/kg, Practically Nontoxic
Eye Irritation (Rabbit): (FHSA) Corrosive
Skin Irritation (Rabbit): (FHSA) 3.3 on a scale of 8.0, Moderately Irritating

PHYSICAL DATA

Appearance and Odor: White, crystalline, free-flowing granules or powder; odorless

pH (1% solution @ 25°C): 12.0

Bulk Density (lbs./cu. ft.): Powder 61-65
Granular 58-64

Solubility (g/100 g H_2O) (Anhydrous Salt Basis):
11.6 @ 25°C
17.5 @ 40°C
35.3 @ 60°C
61.3 @ 80°C
84.5 @ 100°C

Note: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

SPILL, LEAK & DISPOSAL INFORMATION

Waste Disposal: Dispose of in a landfill in accordance with all local, state and federal regulations.

Spill or Leakage Procedures: Sodium phosphate, tribasic, as currently defined, is a *hazardous substance* in the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund) and in the current federal regulations 40 CFR, Part 116 (Section 311, Clean Water Act) with a reportable quantity of 5,000 pounds when released to the environment. Since federal, state and local laws may vary, consult your attorney or appropriate regulatory officials for information relating to spill reporting.

Sweep, scoop or vacuum up all spilled material, contaminated soil and other contaminated material and place in containers. If possible, complete cleanup on a dry basis. After all practical dry cleanup has been done, residual contamination can be flushed with plenty of water.

ADDITIONAL COMMENTS

Environmental Toxicity Information:

96-hr LC_{50} (Bluegill) : 440 mg/l, Practically Nontoxic
96-hr LC_{50} (Trout) : 260 mg/l, Practically Nontoxic

DATE: 8/1/83 **REVISED:** X **SUPERSEDES:** 5/78
MSDS NO.: 010101890

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

Product Acceptability Coordinator
Detergent Materials
Monsanto Industrial Chemicals Co.
314-694-2096
(A Unit of Monsanto Company)

This form has been approved by the Occupational Safety and Health Administration as "equivalent to" OSHA Form 20.

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

15.6 DAILY HEALTH AND SAFETY AUDIT

Site Name:_____ Date:_____

Auditor:_____

SEND A COPY OF COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER

	YES	NO	N/A	COMMENTS (Use back of form if more space is needed)
1. Safety meeting held today?				
2. Emergency procedures discussed during safety meeting?				
3. Vehicle available on-site for transportation to the hospital?				
4. At least two persons trained in CPR and first-aid on-site?				
5. Proper PPE being worn as specified in the HASP?				
Level of PPE being worn: _____				
6. PPE adequate for work conditions?				
If not, give reason: _____				
Upgrade/downgrade to PPE level: _____				
7. If Level B, back-up/emergency person suited up (except for air)?				
8. Monitoring equipment calibrated?				
9. Monitoring equipment in good condition?				
10. Monitoring equipment used properly?				
11. Other monitoring equipment needed?				
List: _____				
12. Monitoring equipment covered with plastic to minimize contamination?				
13. Decon line set up properly?				
14. Proper cleaning fluid used for known or suspected contaminants?				
15. Proper decon procedures used?				
16. Decon personnel wearing proper PPE?				
17. Equipment decontaminated?				
18. Samples decontaminated?				
19. Disposable items changed twice a day or more often if needed?				
20. Proper collection and disposal of contaminated PPE?				
21. Proper collection and disposal of decon fluid?				
22. Buddy system used?				
23. Equipment kept off drums and ground?				
24. Kneeling or sitting on drums or ground not allowed?				
25. Personnel avoid standing or walking through puddles or stained soil?				
26. Zones established?				
27. If night work to be conducted, adequate illumination?				
28. Smoking, eating, or drinking in the Exclusion Zone or CRZ not allowed?				
29. To the extent feasible, contaminated materials handled remotely?				
30. Entry into excavations not allowed unless properly shored or sloped?				
31. All unusual situations on-site listed in HASP?				
If not, what? _____				
Action taken? _____				
HASP revised? _____				
32. All confined spaces identified?				
If not, list: _____				
33. Confined Space Checklists used?				
34. Confined Space Checklists completely and correctly filled out?				

ALL DEFICIENCIES MUST BE CORRECTED IMMEDIATELY!

CHAPTER 16. RESPIRATORY PROTECTION PROGRAM

16.1 INTRODUCTION. This program was developed to govern the selection and use of respiratory protective devices by ABB-ES personnel. The program is intended to comply with OSHA requirements as set forth in 29 CFR 1910.134(b). The scope of this program is limited to activities related to field investigations of potentially hazardous waste disposal sites.

16.2 PERSONNEL REQUIREMENTS. All personnel assigned to field activities at hazardous or potentially hazardous locations are currently required by ABB-ES's health and safety policies to be enrolled in the corporate health monitoring program. Part of this program involves spirometry, a measure of the respiratory system status. No personnel may be assigned to the use of or may withdraw from stock any respiratory protective device without a physician's certification that use of the device will not be injurious to health. Psychological limitations (e.g., claustrophobia) are also considered in personnel assignments. Training in the use of the selected device and fit testing, as described herein, are also required.

Personnel will not be assigned duties that require a respirator when facial hair, skullcaps, or eyeglasses will interfere with a proper fit. Contact lenses may not be worn with any respiratory protective device. Eyeglass frames that fit inside the respirator facepiece are provided as necessary.

16.3 APPLICABLE EQUIPMENT. ABB-ES maintains the following respiratory protective equipment:

- full-face chemical/mechanical air-purifying respirators
- SCBA
- full-face airline-supplied breathing apparatus
- 5-minute escape air supply

This equipment is intended for use on an as-needed basis, to be determined by an evaluation of on-site conditions. Respiratory protective equipment should not be used arbitrarily by any ABB-ES personnel. Selection criteria are presented separately; training is required in the use of each type of equipment before drawing from stock.

16.4 PERSONNEL TRAINING. Training of personnel in the proper use and care of respiratory protective equipment is considered essential to the success of the program. Training encompasses the following topics:

- respiratory protection principles
- selection of appropriate equipment
- use of equipment
- maintenance of equipment
- fit testing

Information regarding each topic is presented as standard respiratory protection procedures in the corporate health and safety program manual.

16.5 PROGRAM ADMINISTRATION AND DOCUMENTATION. Administration of the ABB-ES Respiratory Protection Program is the responsibility of the HSM, and includes the following:

- respirator selection
- personnel training
- fit testing
- respirator maintenance
- documentation
- program evaluation and improvements
- personnel pulmonary testing and certification

Fit testing and respirator maintenance is performed by the equipment manager of ABB-ES's Sample Control and Staging Center in Portland, Maine, and designated, trained employees at the other offices. All fit-testing and respirator maintenance is conducted under the administration of the HSM. Major maintenance is performed by manufacturer-certified technicians only. Personnel training in respiratory protection is one aspect of the HSM's ongoing personnel training programs. Program evaluation is a dynamic process, occurring each time a project HASP is prepared.

Medical supervision of personnel occurs as part of the ABB-ES health monitoring program, also administered by the HSM. Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of the ABB-ES respiratory protection program is achieved through several media, as follows:

- Documentation of respirator selection is included in the hazard assessment of each site's HASP.

- Documentation of personnel training is maintained in both hardcopy and computerized files.

- Documentation of medical surveillance is achieved indirectly by maintaining a list of enrolled employees in the health monitoring program, and directly through physician certification of personnel allowed to be assigned respiratory protective devices.

- Using the appropriate form, documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center and with the HSM or designee.

- Documentation of site surveillance is required both by this program and by the HASP for each site. Records of site surveillance are created by the HSO and maintained in project files.

- Respirator inspection and maintenance records are created and maintained by the equipment manager for each respirator, SCBA, and escape respirator.

Inspection and documentation occurs either before each unit is removed from stock and when it is returned, or monthly.

16.6 INSPECTION, MAINTENANCE, AND STORAGE

16.6.1 Introduction Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator, in one sense, is more dangerous than not wearing a respirator at all. Personnel wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance because they generally are used infrequently, and then in the most hazardous and demanding circumstances. Serious injury or death can result from wearing a defective device during an emergency escape or rescue. The respirator program includes the following components:

- inspection for defects (including a leak check)
- cleaning and disinfecting
- repair as required
- proper and sanitary storage of equipment

16.6.2 Inspection for Defects The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Two types of inspections will be performed: (1) while the respirator is in use, and (2) while it is being cleaned. Because the use and cleaning will be performed primarily by the same personnel, these inspections may become concurrent.

16.6.3 Frequency of Inspection OSHA requires that "All respirators be inspected before and after each use," and that those not used routinely (i.e., emergency escape and rescue devices) "shall be inspected after each use and at least monthly...." Obviously, emergency escape and rescue devices do not require inspection before each use.

16.6.4 Inspection Procedures Respirator inspection will include checking of the following:

- tightness of the connections
- facepiece
- valves
- connecting tubes
- canisters, filters, or cartridges

In addition, the regulator and warning devices on a SCBA will be checked for proper functions.

16.6.5 Field Inspection of Air-purifying Respirators Routinely used air-purifying respirators will be checked as follows before and after each use:

1. Examine the facepiece for:

   - excessive dirt
   - cracks, tears, holes, or physical distortion of shape from improper storage
   - inflexibility of rubber facepiece (stretch and knead to restore flexibility)
   - cracked or badly scratched lenses in full facepieces
   - incorrectly mounted full facepiece lenses, or broken or missing mounting clips
   - cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s)

2. Examine the head straps or head harness for:

   - breaks
   - loss of elasticity
   - broken or malfunctioning buckles and attachments
   - excessively worn serrations on head harness, which might permit slippage (full facepieces only)

3. Examine the exhalation valve for the following after removing the cover:

   - foreign material (e.g., detergent residue, dust particles, or human hair under valve seat)
   - cracks, tears, or distortion in the valve material
   - improper insertion of the valve body in the facepiece
   - cracks, breaks, or chips in the valve body, particularly the sealing surface
   - missing or defective valve cover
   - improper installation of the valve in the valve body

4. Examine the air-purifying element(s) for:

   - incorrect cartridge, canister, or filter for the hazard
   - incorrect installation, loose connections, missing or worn gasket, or cross-threading in the holder

- expired shelf-life date on the cartridge or canister

- cracks or dents in the outside case of the filter, cartridge, or canister indicated by the absence of sealing material, tape, or foil over the inlet

- identical cartridges if more than one are used

16.6.6 Care and Cleaning of Self-contained Breathing Apparatus The proper care of SCBAs involves the following:

- inspection for defects
- cleaning and disinfecting
- repair
- storage

The following checklist is to be used by personnel whenever they check out a SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repair person.)

1. Preliminary Inspection. Check to ensure that:

   - high-pressure hose connector is tight on cylinder fitting
   - bypass valve is closed
   - mainline valve is closed
   - there is no cover or obstruction on regulator outlet
   - pressure in the tank is at least 1,800 psi

2. Backpack and Harness Assembly.

   - Straps

     - visually inspect for complete set
     - visually inspect for frayed or damaged straps that may break during use

   - Buckles

     - visually inspect for mating ends
     - check locking function

   - Backplate and Cylinder Lock

     - visually inspect backplate for cracks and for missing rivets or screws
     - visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged

3. Cylinder and Cylinder Valve Assembly.

- Cylinder

  - physically check cylinder to ensure that it is tightly fastened to backplate
  - check hydrostatic test date to ensure that it is current
  - visually inspect cylinder for large dents or gouges in metal

- Head and Valve Assembly

  - visually inspect cylinder for presence of valve lock
  - visually inspect cylinder gauge for condition of face, needle, and lens
  - open cylinder valve and listen or feel for leakage around packing (if leakage is noted, do not use until repaired); note function of valve lock

4. Regulator and High-pressure Hose.

- High-pressure Hose and Connector. Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)

- Regulator and Low-pressure Alarm

  - Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure).

  - Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.

  - Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 seconds. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

  - Open cylinder valve.

  - Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time,

indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.

- Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.

5. Facepiece and Corrugated Breathing Tube.

   • Facepiece

     - Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.

     - Retaining clamp properly in place, visually inspect lens for proper seal in rubber facepiece, and for cracks or large scratches.

     - Visually inspect exhalation valve for visible deterioration or foreign materials buildup.

   • Breathing Tube and Connector

     - Stretch breathing tube and visually inspect for deterioration and holes.

     - Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.

     - Perform a negative pressure test on facepiece.

       a. Don backpack and facepiece.

       b. With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.

       c. Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 seconds. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.

6. Storage of Units. Check that:

   • cylinder is refilled as necessary and unit is cleaned and inspected

   • cylinder valve is closed

- high-pressure hose connector is tight on cylinder
- pressure is bled off high-pressure hose and regulator
- bypass valve is closed
- mainline valve is closed
- all straps are completely loosened and laid straight
- facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals

16.6.7 Cleaning and Sanitizing Any good detergent may be used, followed by a disinfecting rinse or a combination disinfectant-detergent for a one-step operation. Reliable, effective disinfectants can be made from readily available household solutions, including the following:

- Hypochlorite solution (50 ppm of chlorine) can be made by adding approximately 2 milliliters of bleach (e.g., Clorox) to 1 liter of water, or 2 tablespoons of bleach per gallon of water. A 2-minute immersion disinfects the respirators.
- Aqueous solution of iodine (50 ppm of iodine) can be made by adding approximately 0.8 milliliter of tincture of iodine per liter of water, or 1 teaspoon of tincture of iodine per gallon of water. A 2-minute immersion is sufficient to disinfect the respirators.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140 °F; however, to ensure adequate cleaning, it should not be less than 120 °F.

16.6.8 Rinsing The cleaned and disinfected respirators should be rinsed thoroughly in water (140 °F maximum) to remove all traces of detergent and disinfectant. This is important for preventing dermatitis.

16.6.9 Drying The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes; however, care must be taken not to damage or distort the facepieces.

16.6.10 Reassembly and Inspection To avoid contamination, the clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area. The inspection procedures were discussed previously; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking. The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks. For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check should be performed.

16.6.11 Maintenance and Repair Replacement or repair should be done only by trained, experienced persons using parts designed for the respirator. Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device. This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low-pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

16.6.12 Respirator Storage Respirators must be stored properly to protect against the following:

- dust
- sunlight
- heat
- extreme cold
- excessive moisture
- damaging chemicals
- mechanical damage

Damage and contamination of respirators may occur if they are stored on a workbench; in a tool cabinet or toolbox among heavy tools, greases, and dirt; or in a vehicle.

CHAPTER 17. OTHER CONSIDERATIONS

17.1 ILLUMINATION. Site operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light, downrange operations must halt in time to permit personnel and equipment to exit the Exclusion Zone and proceed through decontamination before dusk. Conversely, operations will not be permitted to begin until lighting is adequate.

17.2 SANITATION. Provisions must be made for sanitation facilities for the site work force. At a minimum, the provision of toilet facilities must meet the requirements of 29 CFR 1910.120(n), which includes one facility for less than 20 employees, or one toilet and one urinal for every 40 employees, up to 200; then one of each for every 50 employees. If it is a mobile crew and they have transport readily available, the requirements do not apply.

17.3 HEALTH AND SAFETY AUDIT PROCEDURES Regular health and safety audits will be conducted to ensure compliance with health and safety policy and procedures. The HSO will perform periodic audits, with the goal of one audit per shift, using the health and safety audit form (see Chapter 15.0). Auditing may be performed on any ABB-ES site by the HSS or the HSM, and will include health and safety evaluations of all work activities. The audits will be an unannounced evaluation of sites selected at the discretion of the HSM or HSS, with the goal of 10 percent of active sites being subject to audits each quarter.

Results of each site health and safety audit will be summarized in an audit report provided to the site HSO, the Project Manager, and the Operational Group Manager charged with responsibility for the project. Where the audit report identifies deficiencies, it will be the Project Manager's responsibility to promptly implement corrective action. The corrective action undertaken will be outlined in a written report submitted to the HSS and the HSM. The HSM or the HSS will retain the original audit report that has been signed by the Project Manager and the HSO to acknowledge receipt of the audit's findings. Any mitigating comments submitted to the HSM or the HSS will be appended to the original report.

CLEAN DISTRICT I

GENERIC HEALTH AND SAFETY PLAN

APPENDIX A

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE SPECIFIC
HEALTH AND SAFETY PLAN

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REFERENCES

The following chapters of the Navy CLEAN Program District I Generic HASP are applicable for the work anticipated at the site:

___ 2.0 AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL

___ 3.0 TRAINING PROGRAM

___ 4.0 MEDICAL SURVEILLANCE PROGRAM

___ 5.0 ENGINEERING CONTROLS

___ 6.0 PERSONAL PROTECTIVE LEVEL DETERMINATION

___ 7.0 MONITORING EQUIPMENT

___ 8.0 ZONATION

___ 9.0 WORK PRACTICES

___ 10.0 CONFINED SPACE ENTRY PROCEDURES

___ 11.0 EXCAVATION AND TRENCHING

___ 12.0 TEMPERATURE EXTREMES
- ___ HEAT STRESS
- ___ COLD STRESS

___ 13.0 DECONTAMINATION

___ 14.0 EMERGENCY PLANNING

___ 15.0 HEALTH AND SAFETY FORMS AND DATA SHEETS
- ___ HEALTH AND SAFETY AUDIT FORM
- ___ ACCIDENT REPORT FORM
- ___ HSO CHECKLIST FOR FIELD OPERATIONS
- ___ MATERIAL SAFETY DATA SHEETS
- ___ LIQUI-NOX
- ___ ETHYL ALCOHOL (denatured)
- ___ TRISODIUM PHOSPHATE
- ___ OSHA POSTER
- ___ DAILY HEALTH AND SAFETY AUDIT FORM

HEALTH AND SAFETY PLAN
PART I

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1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the Navy CLEAN Program District I (CLEAN) HASP and is intended to meet the requirements of 29 CFR 1910.120. As such, the HASP addresses those activities associated with field operations for this project. Compliance with this HASP is required for all ABB-ES personnel, contractor personnel, or third parties entering the site.

1.2 PROJECT PERSONNEL.

1.2.1 Project Manager The project manager (PM) is the individual with overall project management responsibilities. Those responsibilities as they relate to health and safety include provision for the development of this site-specific HASP; the necessary resources to meet requirements of this HASP; the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements; and the means and materials necessary to resolve any health and safety issues that are identified or that developed on the project.

1.2.2 General Site Supervisor The General Site Supervisor is either the PM or the PM's designee who is on-site and vested with the authority by the PM to carry out day-to-day site operations, including interfacing with the site Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The HSO for this project has been designated by the PM with concurrence of the Health and Safety Supervisor (HSS) or Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM through the HSS for the duration of his/her assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the CLEAN HASP. The HSO will investigate all accidents, illnesses, and incidents occurring on-site. The HSO will also conduct safety briefings and site-specific training for on-site personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting an ABB-ES site in response to health and safety issues. The HSO, in consultation with the HSS or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.2.4 Other Functional Titles The following is a list of other personnel who will be involved in this project and their general responsibilities:

Position Title	Responsibilities

1.3 TRAINING. Training is defined under the CLEAN HASP, and all personnel entering potentially contaminated areas of this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 3.0 of the CLEAN HASP for further information.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the CLEAN HASP. Personnel who have not received medical clearance will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 4.0 of the CLEAN HASP for further information.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE.

2.2 SITE HISTORY AND LAYOUT.

2.3 SCOPE OF WORK (WORK PLAN)

3.0 TASK ANALYSIS

3.1 TASK ONE.

3.1.1 Hazardous Substances The materials identified are those known or suspected to be present on-site, along with any established exposure limits for those substances.

3.1.2 Site Risks

3.1.2.1 Health Hazards

3.1.2.2 Safety Hazards

3.1.2.3 Conclusion/Risk Assessment

3.1.3 Protective Measures

3.1.3.1 Engineering Controls

3.1.3.2 Levels of Protection

3.1.4 Monitoring Monitoring of the work environment will be undertaken to ensure that Immediately Dangerous to Life or Health (IDLH) or other dangerous conditions are identified. At a minimum, this monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

3.1.4.1 Air Sampling To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or

downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO.

The following sampling equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

1.

2.

3.

4.

5.

3.1.4.2 Personal Monitoring Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter on-site. Personal monitoring will be conducted on a representative basis. Personnel who are represented by the sampling will be noted in field logs.

The following personal monitoring equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the maintenance and calibration of the equipment.

1.

2.

3.

4.

5.

3.N TASK N

4.0 DATA SHEETS

5.0 SITE CONTROL

5.1 ZONATION. The general zonation protocols that should be employed at hazardous waste sites are described in Chapter 8.0 of the CLEAN HASP. The site-specific zonation that will be used for this project is described as follows:

5.2 COMMUNICATIONS

When radio communication is not used, the following air horn signals will be employed:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)

5.3 WORK PRACTICES. General work practices to be used during ABB-ES projects are described in Chapter 9.0 of the CLEAN HASP. Specific work practices necessary for this project or those that are of significant concern are described as follows:

6.0 DECONTAMINATION/DISPOSAL

All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination, which will take place in the contamination reduction zone.

6.1 PERSONNEL DECONTAMINATION

6.1.1 Small Equipment Decontamination

6.1.2 Heavy Equipment Decontamination

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS

7.0 EMERGENCY/CONTINGENCY PLAN

This section identifies emergency/contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP. The following subsections present site-specific emergency/contingency planning information.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both on- and off-site will be directed through the HSO or designee.

7.2 EVACUATION.

7.3 EMERGENCY MEDICAL TREATMENT/FIRST AID. Any personnel injured on-site will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 ADMINISTRATION

8.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the Project Manager and the HSS. Certification involves the completion of appropriate training, a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system, and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED ABB ENVIRONMENTAL TEAM PERSONNEL:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

OTHER CERTIFIED PERSONNEL:

_____	_____
_____	_____
_____	_____
_____	_____

* FIRST-AID-TRAINED
\+ CPR-TRAINED

8.2 HEALTH AND SAFETY PLAN (HASP) APPROVALS. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

Health and Safety Officer	Date
Project Manager	Date
Health and Safety Manager/Supervisor	Date

8.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

8.5 EMERGENCY TELEPHONE NUMBERS

Police Department	( ) -
Rescue Service	( ) -
Primary Hospital	( ) -
Alternate Hospital	( ) -
Fire Department	( ) -
Off-site Emergency Services	( ) -
Poison Control Center	(800) 962-1253
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	( ) -
Site HSO: _____	( ) -
General Site Supervisor: _____	( ) -
Project Manager: _____	( ) -
ABB Environmental HSM: C.E. Sundquist	(207) 775-5401 x101

8.6 ROUTES TO EMERGENCY MEDICAL FACILITIES

The primary source of medical assistance for the site is:

DIRECTIONS TO PRIMARY:

The alternate source of medical assistance for the site is:

DIRECTIONS TO ALTERNATE: